

Intelligent Laser System

III-NM

Operation Manual

VERSION 1.5



Laser Tools & Technics Corp.



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CHAPTER 1 SAFETY GUIDELINE

1.1 Safety Declaration

The Intelligent Laser System III-NM (ILS-III-NM) is a high performance cutting/engraving machine in a convenient package. When installed properly and used for its intended purposes according to the instructions provided, the laser is a class 1 device (i.e. very safe). However, failure to observe recommended safety procedures may result in exposure to hazardous radiation. In addition, failure to properly vent the laser during cutting/engraving may result in exposure to hazardous gases.

ALWAYS OBSERVE THE SAFETY REGULATIONS.

**DO NOT OPERATE THE LASER
WITHOUT PROPER VENTILATION.**

In other word, in order to understand safe installation and operation procedures, please take the time to read the manual.

Safety is only one of the many advantages of reading the manual. After reading the manual, you may also avoid some frustration when setting up and operating the system. You may also learn some tricks that will save you some time in the long run. Last but not least, you will learn how to refer certain key information in the future.

If you have operated another laser system, please take the time to learn the specifics of the ILS-III-NM. If you have never operated a laser system before, pay particular attention to the safety section. The cutting light emitted by the laser is not visible. Know the path of the laser, and never put any body part in its path. Severe burns and /or blindness may result. Such precautions are only necessary if LTT's technician is doing service work on the laser with the safety override key installed. Under such conditions, the system becomes a class 4 laser, and there are dangers from direct as well as reflected and scattered radiation. Do not attempt to perform such service or maintenance work without a complete understanding of the relevant safety procedures and regulations.

To avoid accidents such as fire caused by combustible material from improper parameter setting, **IT IS VERY IMPORTANT THAT NEVER OPERATE THE LASER SYSTEM WITHOUT CLOSE SUPERVISION BY THE OPERATOR.**

Please resist the temptation to immediately switch on the laser and engrave. For your safety, please take a few minutes and read through the safety section.

1.2 General Safety Precaution

The ILS-III-NM is a Class I laser device: its housing and integrated safety switches are designed to protect the operator from the laser. Though you may see the effects of the laser reacting with object (such as a bright spot on the object being laser, or a shining needle of light in a cloud of smoke), the laser beam itself is not visible to the human eye. Therefore, extreme caution must be exercised in the operation of the laser.

1. For normal operation, **NEVER** disable the safety switch so that the laser may be operated with either the top or front access doors open. Do not attempt such service/maintenance functions requiring access to the laser beam unless you are a fully trained service technician/engineer wearing laser safety goggles and you are following the exact instructions provided by LTT.
2. Do not watch the laser during operation; the bright light caused by the lasing process can damage the eye.
3. Certain materials, such as rubber stamp, may be inflammable when exposed to the laser beam under the wrong settings. Keep a fire extinguisher near the laser at all times. Wet the material by spraying water on the material can be very useful (but keep water away from the electronics!). Spray a bit of water on the material BEFORE lasing helps to prevent it from burning. **NEVER operate the laser system without close supervision.**
4. The laser and its electronic components operate at high voltages. Do not access the laser or electronic components while power is applied unless you are a fully trained service technician/engineer and following the exact instructions provided by LTT. For normal maintenance, please unplug the laser power cord before accessing these areas.
5. Do not operate the laser without a proper exhaust system. The fumes generated by the engraving/cutting of various materials may damage your health.
6. As with any machine tool, **SAFETY FIRST!** If you're not sure something is safe, please contact LTT.
7. LTT offers training on software, system operation and maintenance.

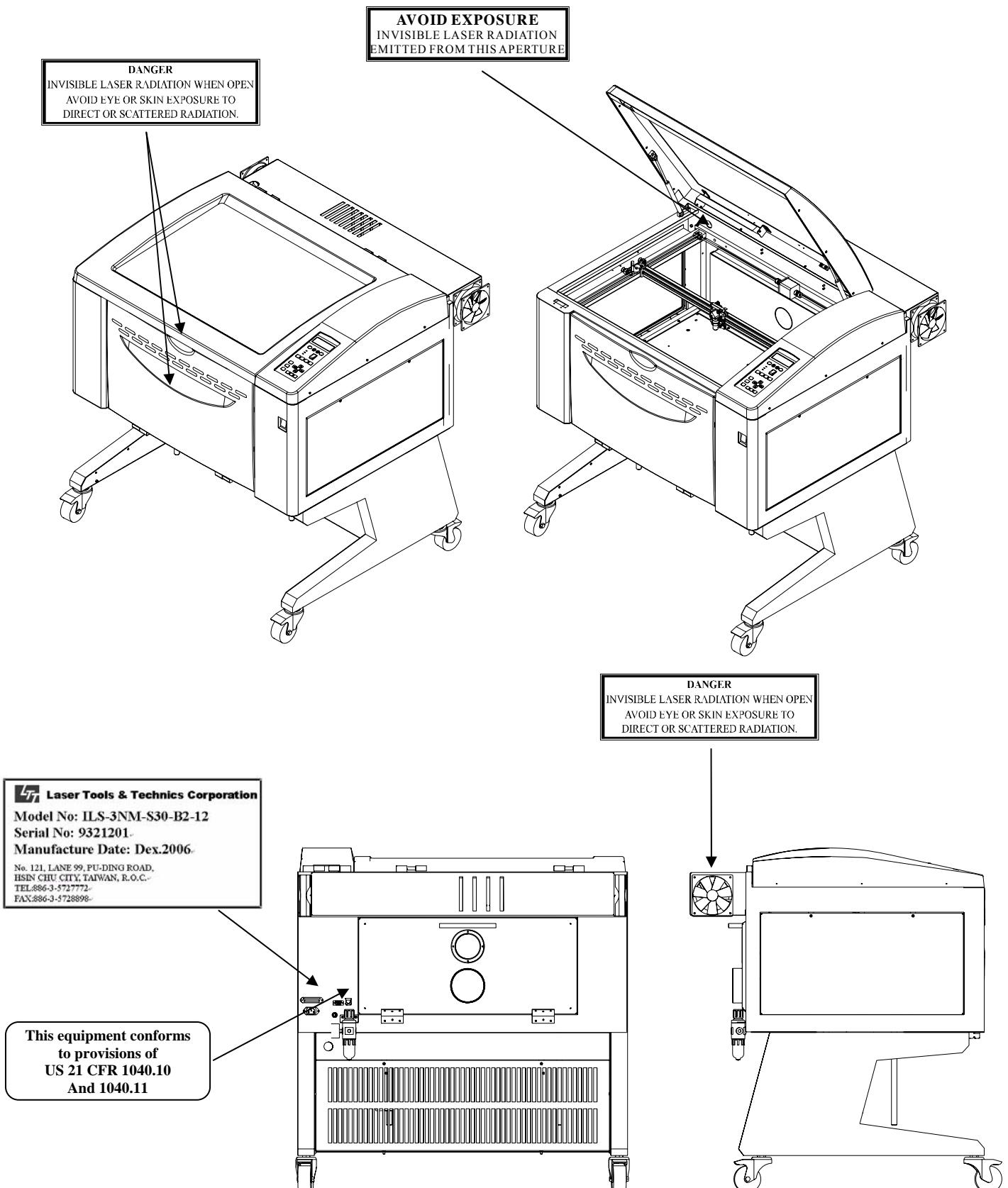
The Intelligent Laser System ILS-III-NM complies with CDRH performance requirements under 21 CFR 1040.10 and 1040.11. Guarantees of suitability or safety are provided only when use in the way that LTT specifies.

CDRH: the Center for Devices and Radiological Health

CFR: the Code of Federal Regulations

1.3 Warning Signs and Marks on the Machine

The following labels are affixed to the ILS-III-NM. These labels must never be removed. If damaged or tampered with for any reason, please request immediate replacement labels from LTT.



1.4 Safety Protection Device

The laser power is connected to two interlocks and a manual laser ON/OFF switch for protecting users/operators.

Interlock

The power supply of the laser source will automatically shut down whenever the top door or the front door is opened, and no laser beam will be emitted. If the top door or the front door is opened during engraving or cutting process, the orange LED, which is used to indicate the laser beam on, will be turned off, and the laser system will be shut down (Note that the motion system will not stop until the file is finished). If the orange LED display on the Control Panel is still blinking after the top door is opened, immediately turn off the laser system and call LTT for technical support. **DO NOT OPERATE ILS-III-NM WHEN INTERLOCK IS DISABLED.**

Laser On and Off Switch

Laser ON/OFF switch is located on the center of the Control Panel. When you wish to shut off the power of laser system in any event, just turn off this switch. Turning off this switch has nothing to do with the motion system. The details are described in section 5-1.

CHAPTER 2 INTRODUCTION

2.1 Function Description

Sweet and Smart Laser Engraver

The Intelligent Laser System III-NM (ILS-III-NM) from Laser Tools & Technics Corp. is a user-friendly, inexpensive and multi-purpose laser engraver system for wide variety of application on materials.

Wide Variety of Applications

The ILS-III-NM can handle batch runs of small to large volume, providing on-the-spot and just-in-time production. Any Windows graphics such as image, logo or text, can be transferred by the laser on to wood, acrylic, leather, stone, etc. In addition, the ILS-III-NM can also function as a cutter/engraver, and has marking on various awards, trophies, gifts, souvenirs, seals and chops, and other items. The ILS-III-NM is ready to meet your challenges!

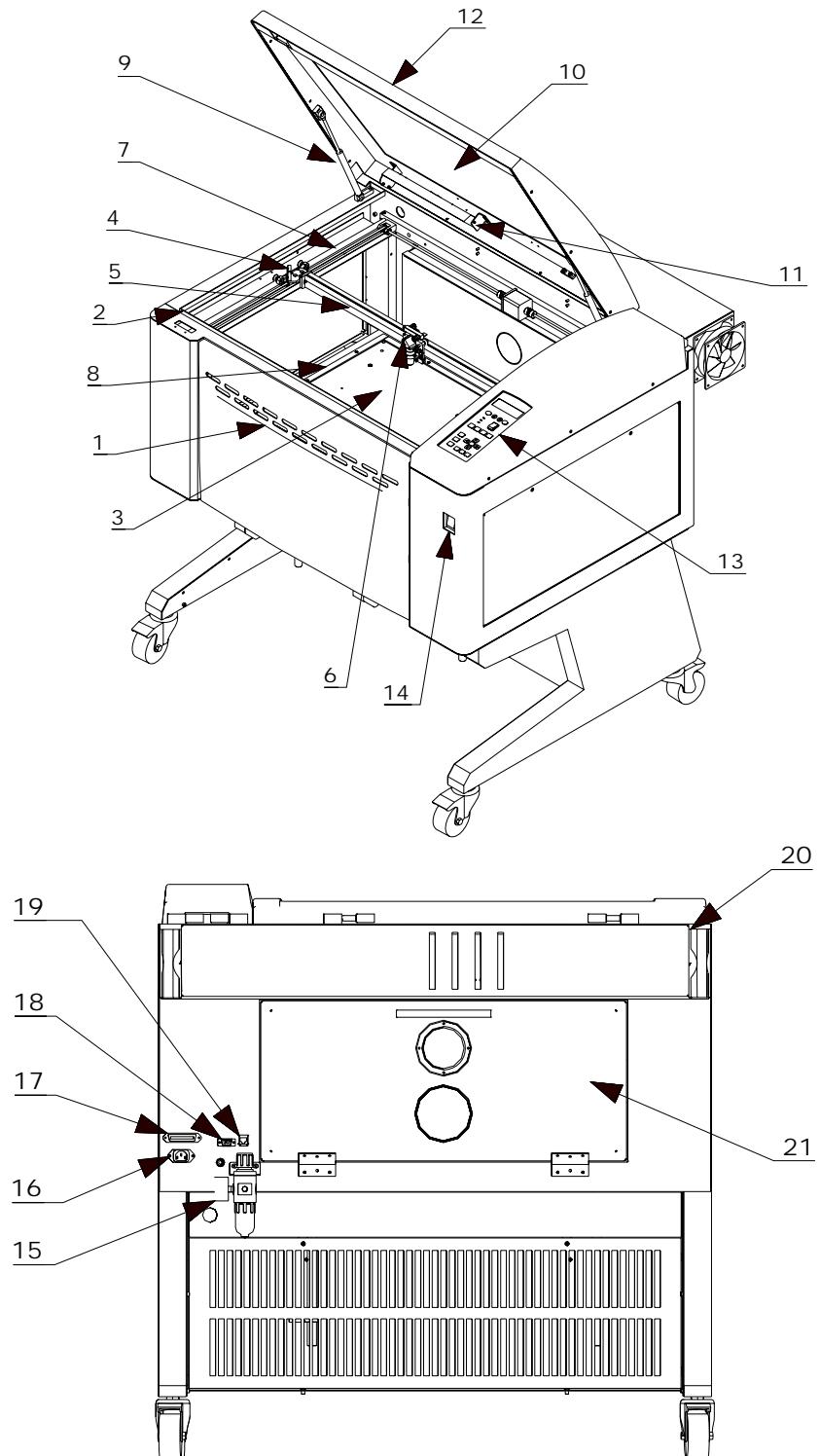
Applicable Materials

Applicable materials include wood, acrylics, coated metal, anodized metal, glass, rubber, leather, marble/stone, fabrics, vinyl, laminated plastics and plastic film.

Applications

The ILS-III-NM is broadly used for cutting and engraving on gifts, trophies, awards, seals and chops, writing instruments, panels, templates, architectural models, masks and stencils, membrane switch materials, card stock, etc.

2.2 Part Description



- | | | |
|-----------------------|-----------------------|--------------------|
| 1.Front Door | 9.Gas Assist Coupling | 17.Parallel Port |
| 2.Interlock | 10.Top Door Window | 18.Serial Port |
| 3.Working Table | 11.Floodlight | 19.Laser Cover |
| 4.Second Reflector | 12.Top Door | 20.Reflector Cover |
| 5.X-Axis Arm | 13.Control Panel | 21.Back Door |
| 6.Focus Lens Assembly | 14.Power Switch | 22.Cooling Fan |
| 7.Y-Axis Arm | 15.Fuse | |
| 8.Ruler | 16.Power Inlet | |

2.3 Machine Specifications

Model	ILS-III-NM-25/30/55/60/100
Laser Source	25/30/55/60/100 Watt, air cooled, CO ₂ laser
Power Requirement	110/220VAC, 20/10Amp, 50/60 Hz
Power Control	Digital power control from 0 ~ 100% with automatic proportional pulsing and color linked power settings.
Speed Control	1524 mm/sec. (60"/sec.)
Resolution	1000DPI, 500DPI, 333DPI, 250DPI, 200DPI, 166DPI
Work Area	660mm x 495mm
Motorized Z-axis adjustment	Z-axis adjustment up to 210mm (8.26").
Max workpiece size	660mm(L) x 495mm (W) x 200mm(H)
Memory Buffer	64 MB. Intelligent memory buffer with automatic data storage up to 99 files with all settings.
Display Panel	LCD display showing current file name, laser power, raster or vector speed, run time, files loaded into buffer, setup and diagnostic menus.
Computer Interface	Parallel port、Ethernet port
Software	Compatible with most Windows Integrated CAD software for graphics and character generation.
Operating Modes	Landscape mode with vector cutting, raster engraving and spot drilling.
Weight	175.5/180/200/202.75/230 kg
Dimension	970mm (L) x 865mm (W) x 990mm (H)
Safety Standard	CDRH Class 1, CE certification
Exhaust	External blower and pipe.

2.4 Standard Accessories and Optional Accessories

Standard Accessories

- Operation Manual
- ILS-III-NM driver disk
- AC power cord
- Parallel cable
- Focusing tool
- Cleaning set

Optional Accessories

- Rotary Fixture
- Honeycomb Cutting Table
- Stamp Fixture
- Air Assist
- Exhaust Equipment

CHAPTER 3 INSTALLATION

3.1 Working Condition

With the proper environment and care, the ILS-III-NM will have a long, operational life. There are six recommendations:

1. Provide clean air and power supply. The laser will perform best where there is minimum dust and has stable and filtered power lines. We recommend a separate circuit with surge suppresser to a **GROUNDDED OUTLET**.
2. Provide proper exhaust system to extract fumes and smokes from the laser system during operation. Operation of the laser without proper ventilation can be hazardous to you and damaging to the laser at the same time. Choose a short and direct path for the exhaust pipe line.
3. Provide a reasonable ambient temperature. Operate at high ambient temperatures (above 30°C) or high ambient humidity (above 70% or where the temperature is near the dew point) may cause inconsistent performance or permanent damage to the system. The proper ambient temperature for standard operation of ILS-III-NM is between 20 ~ 25°C.
4. Provide a vibration free environment. Eliminate or minimize vibration transmitted from the exhaust system, unstable table or flooring system, and machineries nearby.
5. Plan ahead for paths of communication. The laser is connected to its host computer via the parallel port, and must be located within 3 meters around the computer. From a practical point-of -view, it is much more convenience to keep the computer and laser within a close physical proximity.
6. Provide reasonable guidance. A slow, RAM-deficient computer will not affect your laser speed, but it seriously slows down designing and transferring. For example, you can operate with a 486 CPU with 8MB of RAM and a few MB of available hard disk space. The ILS-III-NM print driver needs just a little hard disk space. However, standard graphics files will require lots of space. For example, a typical, small, scanned image requires 100-200K of space (or 5-10 images per MB). Manipulating such images in a computer with minimum RAM (i.e. 8 MB) can be time-consuming and frustrating. Minimum requirements are a mouse, VGA monitor, Windows 2000/XP, and a graphic software which compatible with Windows. If you are using graphics, it is advisable to have a Pentium III CPU with minimum 256MB RAM.

3.2 Exhaust System

Exhaust system must be mounted outside the building. Mount the on and off switch for the blower in a location accessible from the laser. There must be a pipe installed between exhaust system and laser system, and it is recommended to have a short and smooth pipe line, owing to bad structure of pipeline may reduce the flow of air. The diameter of the ductwork should match the air intake of the blower. Make the final connection between the end of the ductwork and the laser using wire-reinforced rubber tubing. Secure with hose clamps at each ends. Note that wire-reinforced, flexible tubing is favorable to reduce the vibration of the laser system caused by the blower. Don't connect the rigid ductwork directly to the laser system. Provide some means to close the ductwork when the blower is not in use. This is especially useful in colder climates where cold air coming into the laser from the outside is not good.

3.3 Computer Recommendations

Using a computer with faster speed, larger memory and storage capacity will allow the graphic images to be produced faster. A faster computer will perform calculations quicker and will shorten transaction time to the laser. The following are our recommended computer equipments.

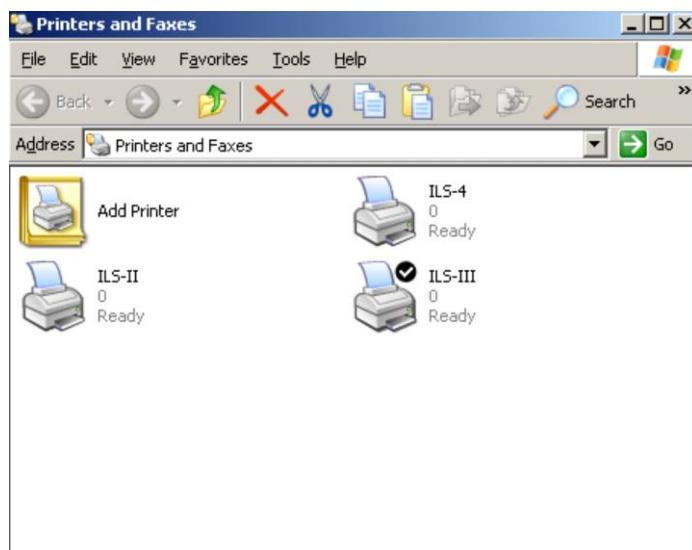
- Pentium III or higher CPU
- 256 MB RAM
- 5 GB hard disk drive or larger
- Color monitor
- Windows Accelerator Graphics Card
- CD-ROM drive
- Microsoft mouse or 100% compatible pointing device
- Microsoft Windows 2000/XP™
- Graphic software compatible with Windows. Such as CorelDraw 12.0™ or AutoCAD 2004

3.4 Printer Driver Installation

The printer driver of ILS-III-NM must be installed under the Microsoft Windows environment. A clear understanding of MS Windows operation is essential for the operation of the laser system. The installation of this driver is identical to other Windows printer driver such as HP printer or EPSON Printer. A simple step-by-step installation procedure for Windows XP is illustrated as follows.

Installation under Windows XP Environment

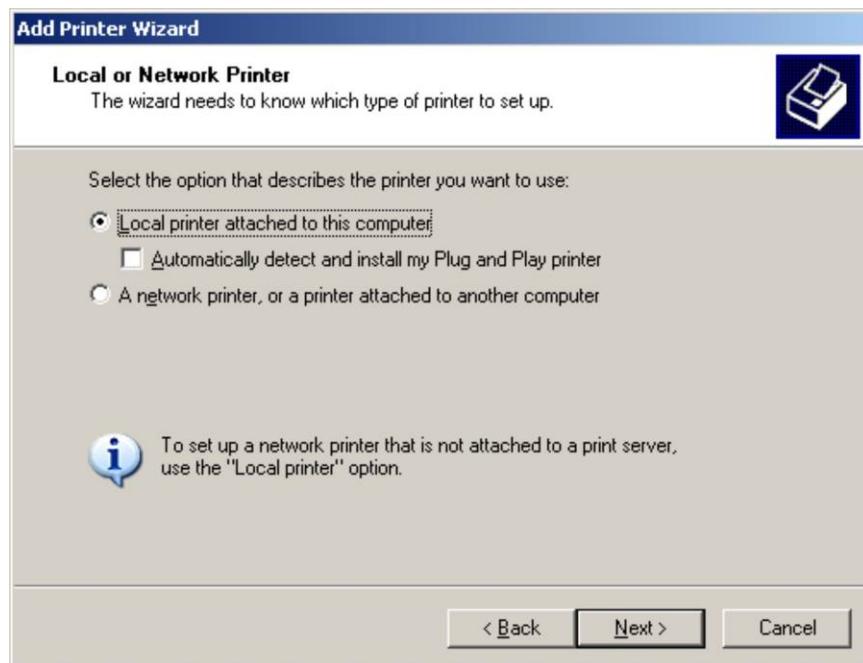
Start Microsoft Windows XP, click **Start** button and point to **Settings**, click on the **Printers** icon and the **Printers** Dialog Box will appear. Double click on the **Add Printer** icon.



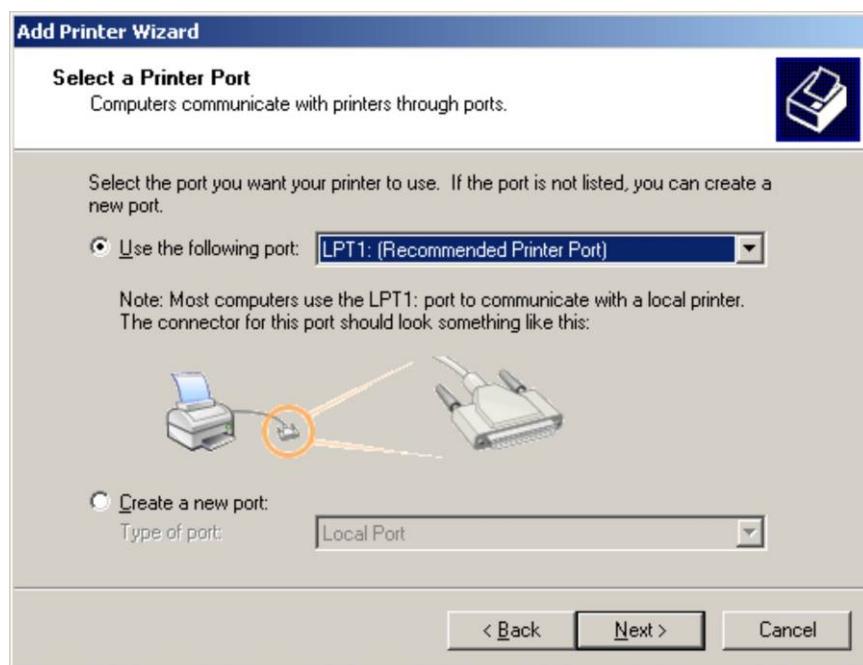
The **Add Printer Wizard** Dialog Box will appear.



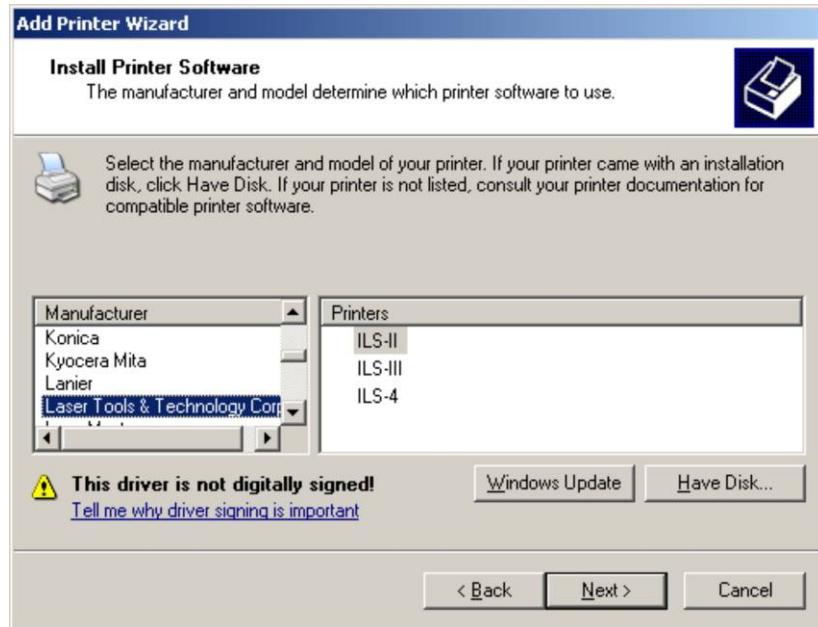
Select "Local printer attached to this computer". Do **not** select "Automatically detect and install my Plug and Play printer". Press "Next" button to continue.



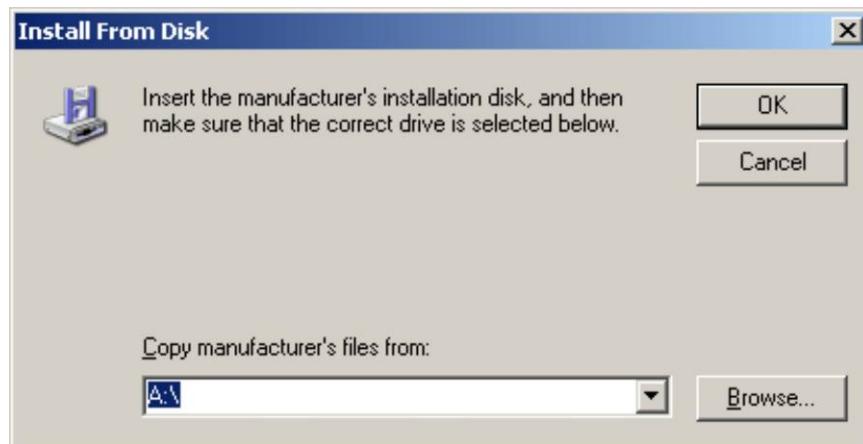
Set print port as "LPT1". Press "Next" button to continue.



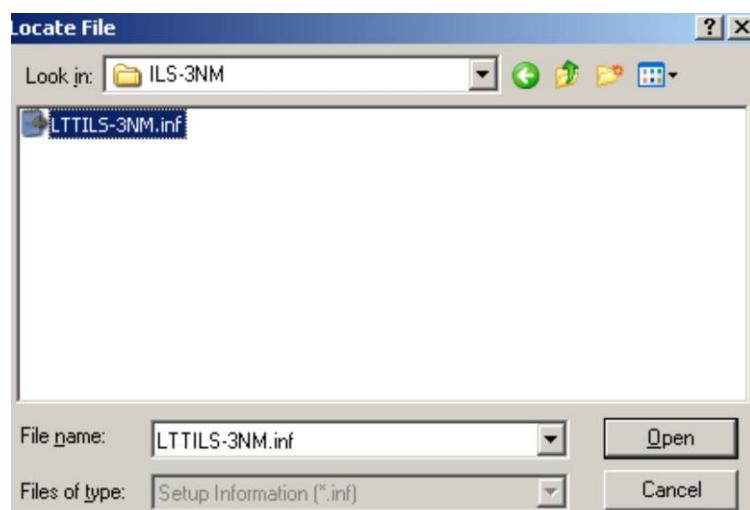
Press "Have Disk..." button.



Press "Browse..." button.



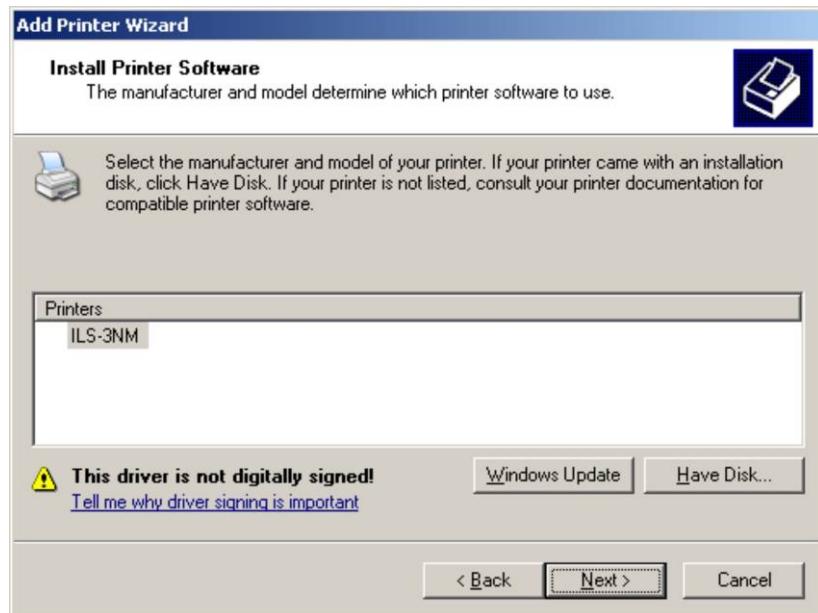
Go to the folder that store the ILS driver. Select "LTTILS-III-NM.INF". Press "Open" button.



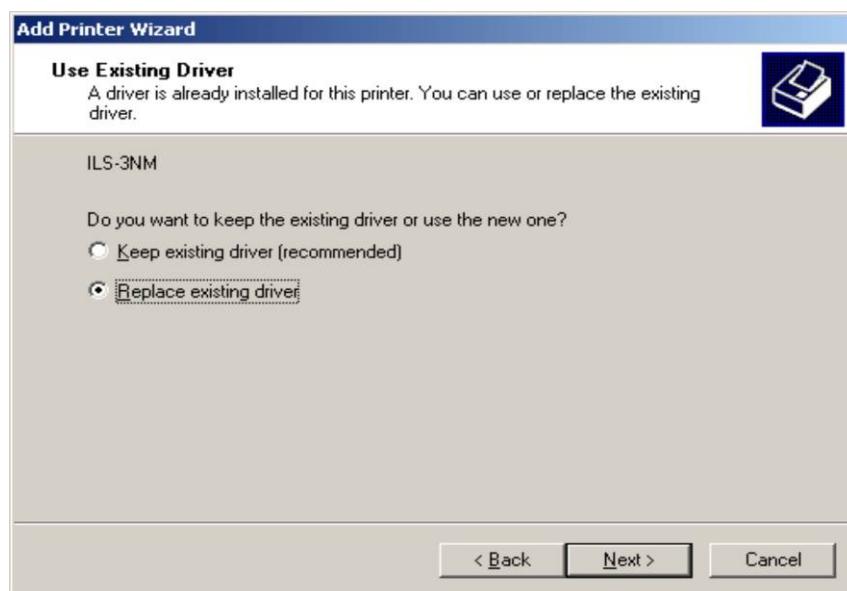
Press “OK” button.



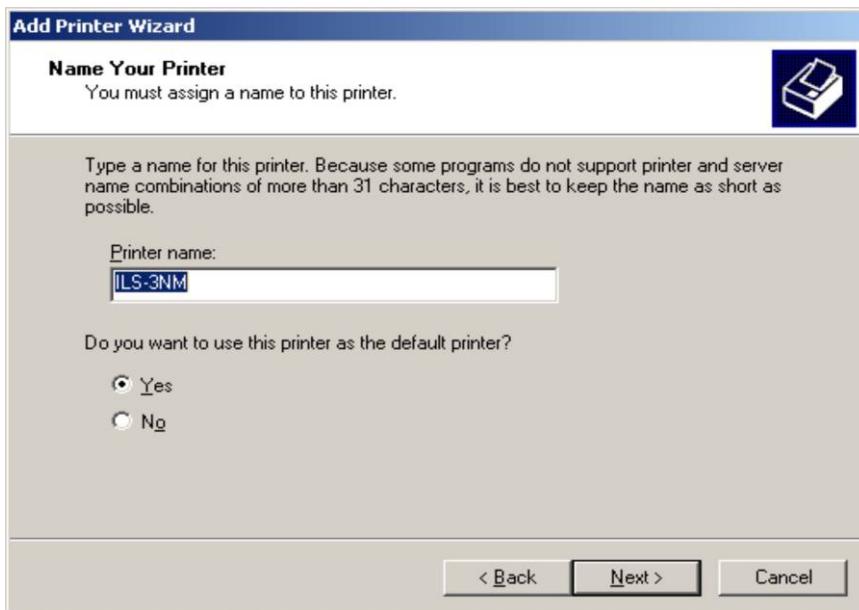
Press “Next” button to continue.



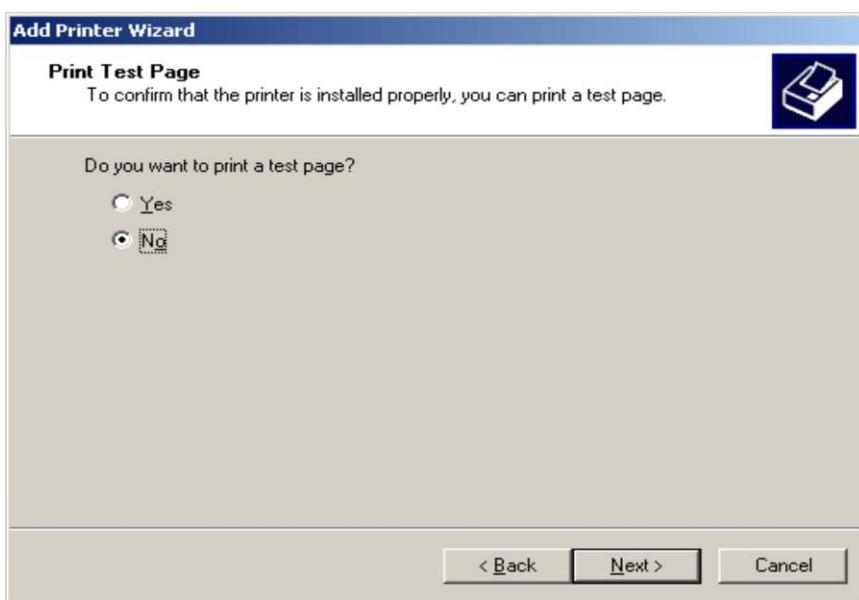
Select “Replace existing driver”. Press “Next” button to continue.



Here you can give a name to the printer or use the default name. Determine whether you want to use this printer as the default print or not. Press “Next” button to continue.



Do not print a test page and press “Next” button.



Press "Finish" button.



Press "Continue Anyway" button.



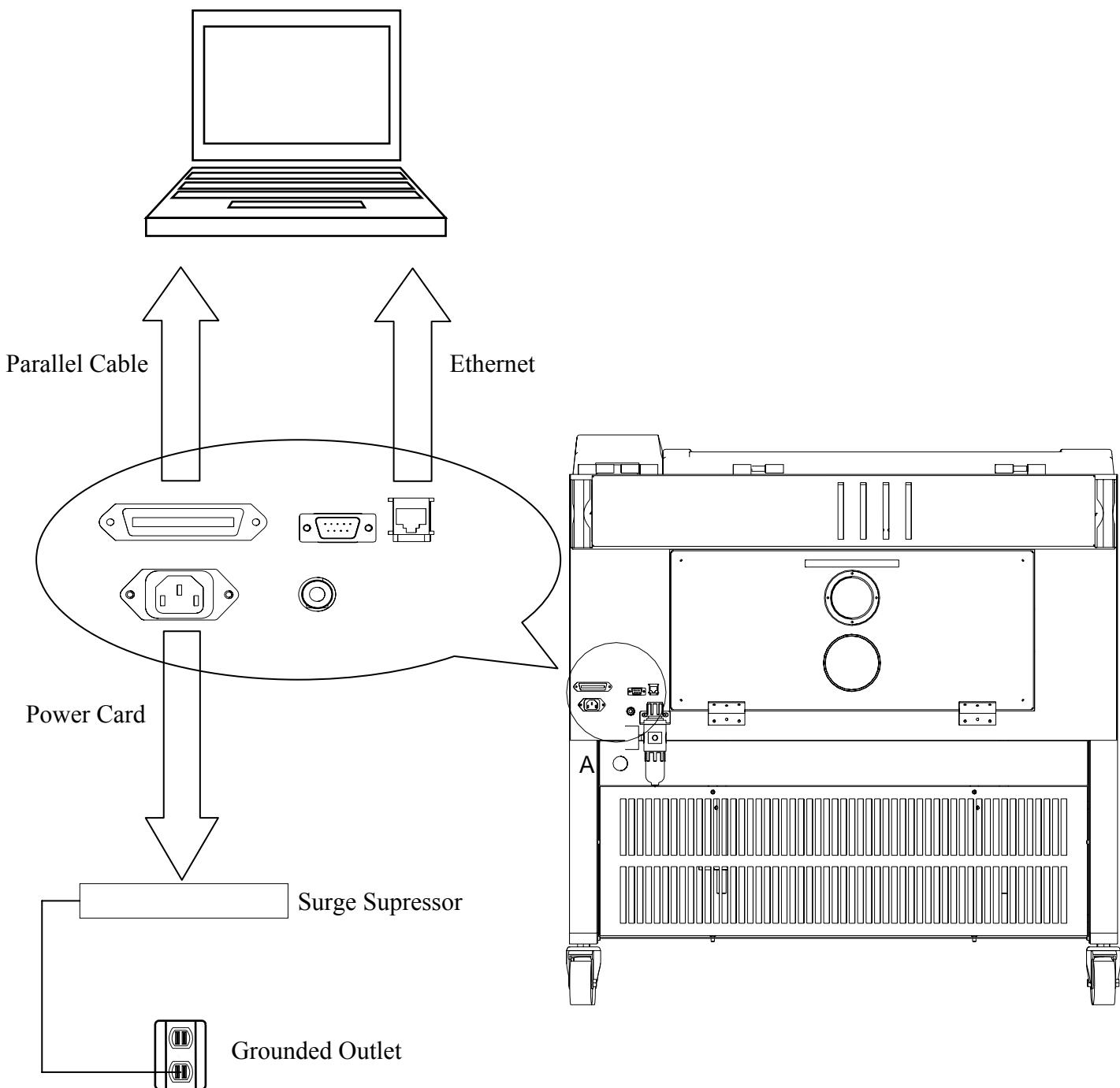
All settings Finish.

3.5 Cabling Connections

CAUTION: Please make the following connections in the exact order as described below. Otherwise, static electricity may damage the computer and/or the electronic components of laser system.

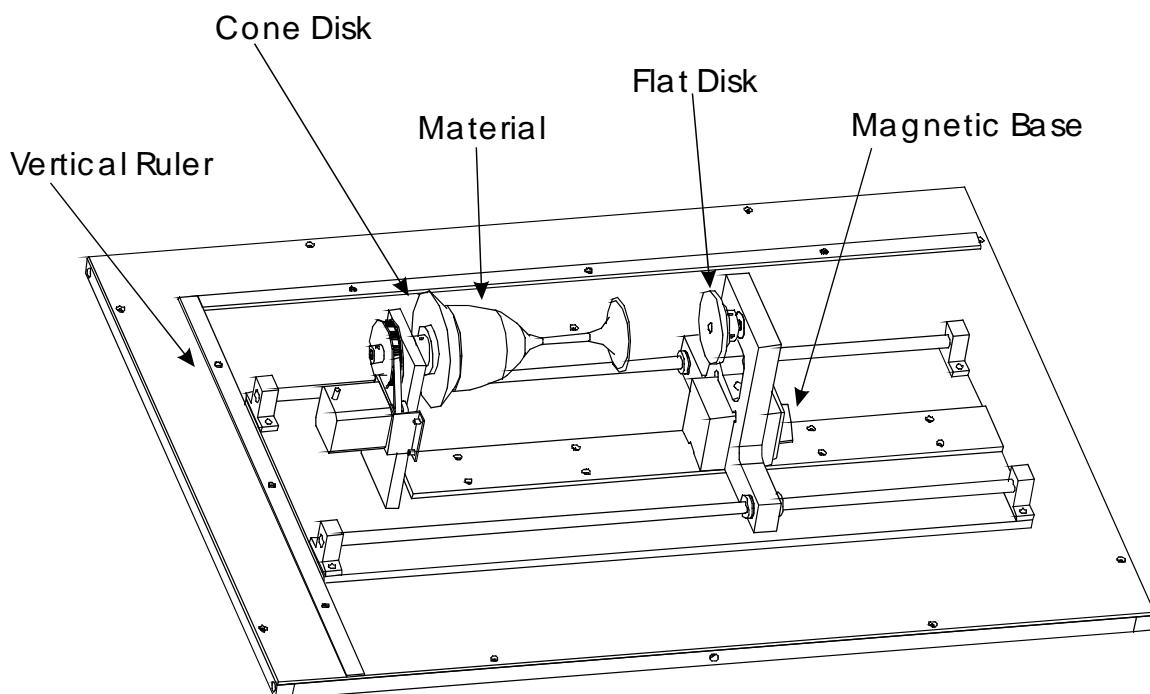
To connect cables in laser system is very simple:

1. Connect the laser system power cord to a good quality surge suppressor and then the surge suppresser to a **grounded outlet**. Do the same for the computer system.
2. Make sure both the computer and laser system are plugged in and turned OFF.
3. Then connect the laser system to the computer using a parallel connection.



3.6 Rotary Fixture Installation

1. Place the Rotary Fixture on the working table with the flat disk on the Rotary Fixture to the right. Position the fixture so that it is squarely aligned with the rulers, and the left side of the fixture against the vertical ruler. The readings on both rulers must match.
2. Attach the Rotary Fixture to the working table by aligning it with the screw holes on the table.
3. Connect the rotary Fixture control cable to the receptacle on the ILS-III-NM.
4. Place the material on the cone shaped disk of the Rotary Fixture. Turn off the magnetic base and slide the flat disk against the other end of the material so the material rests firmly against the flat disk. Then turn on the magnetic base.



CHAPTER 4 INTRODUCTION TO DRIVER FUNCTION

4.1 Software Operation

Because ILS-III-NM is controlled by a standard Windows printer driver, you can create the artwork in your favorite Windows graphics software. When it comes to printing (i.e. engraving/cutting), you simply print to LPT1 just as you would do with a laser printer. Some of the variables regarding communication between your graphics program and the Windows driver are similar to those with any printer.

As in any Windows graphics software, your results may be unpredictable if the page setup in the graphics software does not match that in ILS-III-NM printer driver. Therefore, please be sure that your page size setups are consistent. Most frustration with printing comes from overlooking of the page setup area in the ILS-III-NM driver.

The greatest difference between printing to a laser printer and printing to the ILS-III-NM lies in the enormous flexibility of ILS-III-NM. With a laser printer, the user has very little control over the page size or resolution; no needs for control over print speed; and no needs for control over print power. With ILS-III-NM, the user may need to specify a page size exactly matching the planned graphic (for example, stamp making). The speed, power, resolution, and pulses per inch (PPI) all greatly affect the results.

4.1.1 Page Size

It is a general rule to set the page size of ILS-III-NM printer driver at the maximum and leave it there during working. The results are much more predictable if the frame of reference is consistent. If you change page sizes depending on material size, you must constantly check if the printer driver's page size is the same as the graphic software's page size. It is easy to ruin materials because the laser may engrave 90% of the graphic (that is the other 10% which is inside the graphic software page could be left outside the ILS-III-NM printer driver's page).

4.1.2 The Basics: Laser Modes

The laser prints in two modes: raster and vector.

In raster mode, the laser moves back and forth across the work area, turning on when a color is present in the graphic, and turning off when an area is white. After each pass across the material, the laser moves vertically by a small increment (determined by the horizontal resolution, defined in lines per inch, or LPI), and starts back across the "page". In order to draw the outline of a circle, the laser must go back and forth thousands of times. The laser energizes only a very small percentage of the traveling time (when passing over the outside of the circle).

In vector mode, the laser traces a specific path defined by the graphic. If the path is a circle, the laser follows the path of the circle, nothing more or less. Vector cutting is much faster than raster engraving. The path cut may be as little as 70 microns wide (about 0.003").

The graphic object having raster property or vector property depends on the graphic software you use. In general, any line of minimum width is treated as a vector. Some thinner lines are also treated as vectors. For example, the smallest line width available in your graphics program may be 1 point (1000 points = 1"). However, lines up to 50 points width may be treated as vectors by the graphic software, and lines above 50 points may be treated as raster.

There are several differences in the treatment of raster and vectors by the driver:

1. Raster graphics are engraved first, then vectors. When the laser engravings a filled rectangle with vector outline, the interior of the rectangle is engraved first. Then the laser cuts the outline of the rectangle. If you want to engrave the interior only, you must define the pen width of the rectangle to zero, or define the pen color as white, or disable the pen color's cut flag.
2. Only the top raster is engraved. In a graphic where several filled objects overlap, only the top raster object is engraved. Duplication of raster objects (stacking) has no effect. In order to engrave a raster object multiple times, use the COPY command on the **Control Panel**. Note that an object with white interior prevents the engraving of all underlying raster objects.
3. Except on disable cut flag, all vectors are cut. Vectors hidden by raster graphics or other vectors are still cut. To prevent unexpected vector cutting by hidden shapes, use pen widths of zero, or change the pen color to white. Every copy of a vector object is cut: for example, a stack of five duplicate copies of a line causes five separate passes of the laser.

4.1.3 Color Mapping and Print Order

The ILS-III-NM printer driver uses eight colors to control print orders, power, speed, and PPI (pulse per inch). These eight different colors according to print order are BLACK, RED, GREEN, YELLOW, BLUE, MAGENTA, CYAN, and ORANGE. Each color can be assigned to a distinct power, speed, and PPI.

Please bear in mind that the PPI setting does NOT equate to resolution in the same sense that a 600 DPI laser printer has 2 times the resolution of a 300 DPI printer. In the case of a laser printer, a 600 DPI printer has a dot size 2 times smaller than a 300 DPI printer. In the case of an engraving laser, changing the PPI does not change the spot size; instead, it governs the overlap of the spots in the direction of laser travel. The spot size of laser beam is governed by the focusing lens.

The colors are printed in a pre-defined order, all raster first, then all vectors. For example, the black area will be engraved first, then red area, then green, and so on. The vector parts will be executed right after all raster parts are finished.

There are some advantages in using different colors to present different laser control parameters.

1. You may wish to engrave different areas of material to different depths. For example, when engraving a wood plaque, you may have some areas of direct engraving, and

some areas with vinyl overlay. You may wish to engrave these areas at different power levels to prevent damage to the vinyl, or to achieve comparable depth in the unmasked and masked areas. On the other hand, increased depth of engraving in some materials may not be as simple as increased power or lowered speed. It may be best to engrave the material with several different speeds. It is inconvenient to transfer each such area as a separate file and manually repeat the engraving operation.

2. The item may contain several different types of material. For example, a wooden plaque might have an enameled brass plate. The different materials require different speeds and power levels.
3. You may wish to save time when engraving several copies of the graphic at the same time. For example, you wish to engrave five graphics. If each objects request same working parameter and be set into the same color, the laser will engrave all the area. On the other hand, if each graphic is assigned to a different color (all parameters remain the same), the laser will travel only across the engraved area, greatly reducing the engraving time.
4. You may wish to engrave areas in a specific order. When cutting a center hole out of a rectangle, you'd like to cut the center hole first, then the outside rectangle. Depending on how you are supporting the material, cutting the outside first may cause it to fall, putting the center cut out of focus or at an angle.
5. You may wish to test engraving/cutting a material. One way to speed up the testing process is by designing a test graphic using all eight colors. For example, a series of eight small rectangles, each in a different color, with each color assigned a different power, speed, or PPI, allows you test eight variations at a time. You can also speed this process by saving several print driver files with progressive power levels or speeds.

4.1.4 Color Definition

The ILS-III-NM printer driver defines the eight colors mentioned above according to the following chart. You must use these same definitions in your graphics program. If your color definitions are different, the printed results may be unpredictable. If your graphics software allows you to save color palette, start by creating a palette with the first eight colors as defined above, in the order given, you will save yourself lots of frustration later.

COLOR	RGB		
	RED	GREEN	BLUE
BLACK	0	0	0
RED	255	0	0
GREEN	0	255	0
YELLOW	255	255	0
BLUE	0	0	255
MAGENTA	255	0	255
CYAN	0	255	255
ORANGE	255	128	0

Note that the color assignments have nothing to do with color imaging or color bitmaps. Colors are used simply as a means to indicate different laser parameters for different areas of a graphic.

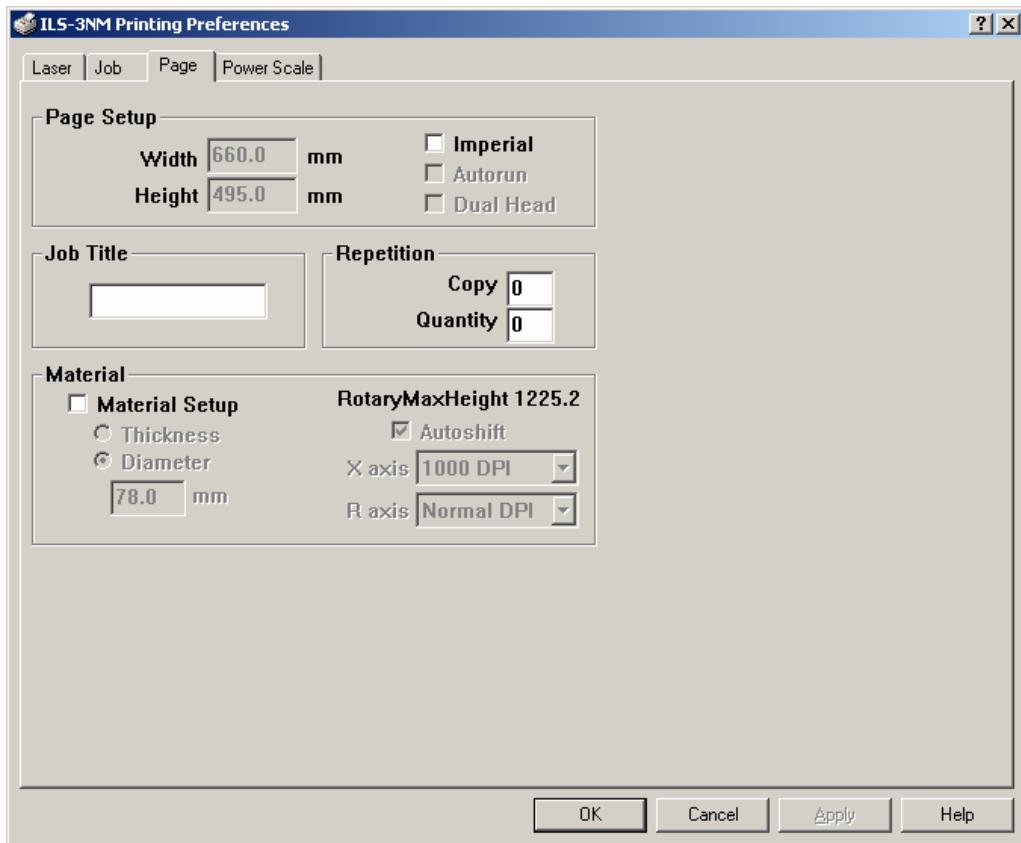
If you use a color other than above eight colors, the driver will choose one of those, which is more closer to that you chose and apply a halftone pattern to represent the original color's shade. For example, a rectangle filled with pink, the driver will analyze the value of RGB in the color of pink and choose one of the pre-defined colors to represent it. You may expect the driver to choose red, but the real color the driver chose is magenta.

If your graphic software has color correction function, you must disable it. Color correction will modify the RGB value of colors before print.

4.2 Driver Function

When you want to print out an artwork, go to **Content** in printer Dialog Box to do detailed parameter setting.

4.2.1 Page



Page Setup

You can set the maximum page size of ILS-III-NM to a horizontal length of 660 mm and vertical height of 495 mm. The page size you set in ILS-III-NM printer driver must be larger than or equal to that you set in the graphic software.

If **Auto run** option is selected and ILS-III-NM's **Auto run** function is enabled, the file will be auto-executed after it is sent to ILS-III-NM. *This function is NOT applicable to ILS-III-NM by now.*

If you use dual option, you must enable **Dual Head** option. This option will restrict the width of page size to avoid second focusing assembly working out of range. *This function is NOT applicable to ILS-III-NM by now.*

Job Title

You can key in a text string to identify each job, this text string will appear on LCD of the machine as file name.

Repetition

Copy: Set the number of times a job file will be executed for a job. If you set **Copy** to 3,

the ILS-III-NM will continuously execute the job file for three times in a single workpiece.

Quantity: Set the number of jobs. This will limit the performable times. If you set **Quantity** to 2, you can just run this job file for two times.

Material

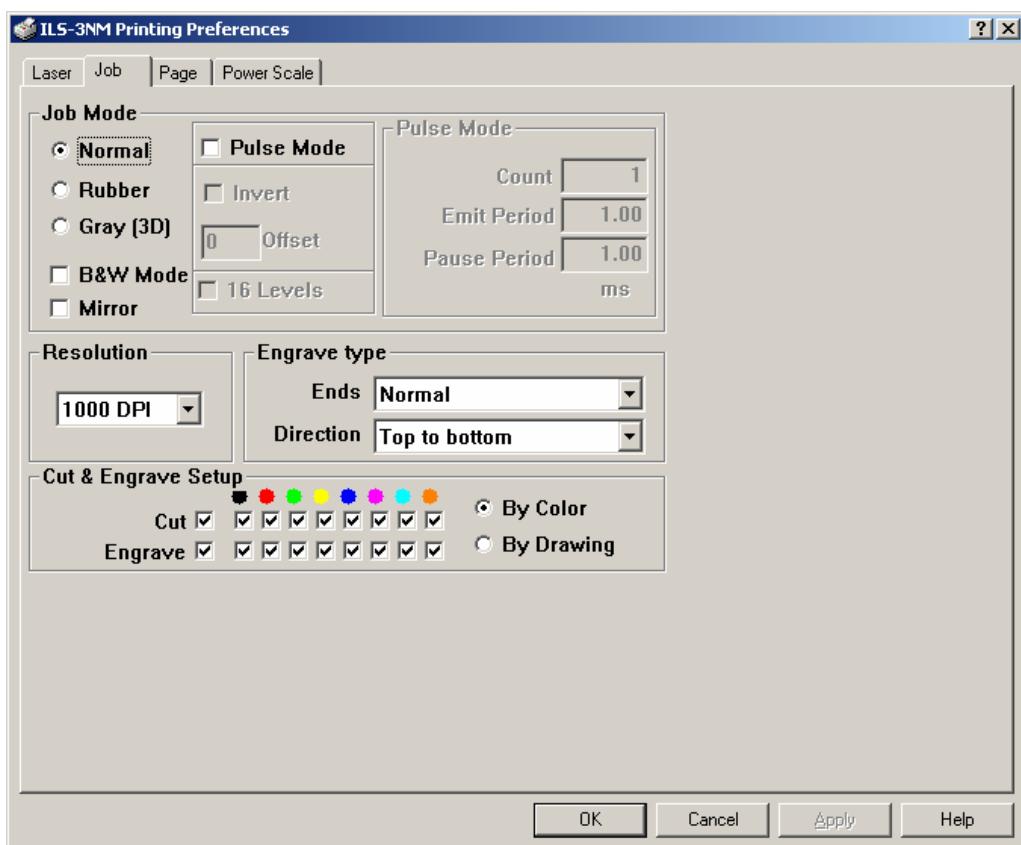
If you enable **Material Setup** option, you can set the diameter of the material. The ILS-III-NM will use diameter to adjust the rotation angle. If you want to use rotary fixture, you must enable **Material Setup**, select **Diameter** option, and key in the material diameter.

When you select rotary mode, you can choose resolution for X-axis and rotary axis(R-axis) individually. X-axis has six resolution options, and rotary axis has three.

The coordinate system does not change for rotary mode, so you must adjust the position of artwork to match the material in X-axis direction.

Rotary Max Height indicates the maximum page height you can set when you use rotary mode. The maximum page height depends on the material diameter and the resolution of rotary axis.

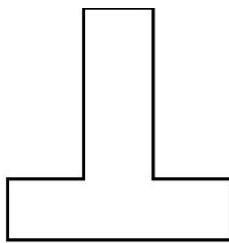
4.2.2 Job



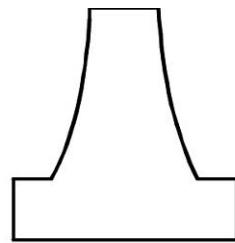
Job Mode

There are three job modes to choose: Normal, Rubber, and Gray [3D] effect.

1. Normal: Normal mode uses eight color settings to engrave and cut graphics drawn in graphic software. You can enable **Pulse Mode** to drill hole. Only the black color is suitable for **Pulse Mode**.
2. Rubber: This mode creates the tapered profile required for high-quality stamp making. The curve of tapered profile depends on the laser power setting in the **Power Scale** function.
If **Invert** option is enabled, the driver will skip the area that has raster object and engrave the white area for each color, so some area may be engraved more than once. If you enable **Invert** option, it is recommended to use one color in the graphic and set the ILS-III-NM printer driver's page equal to the page set in graphic software. *This function is NOT applicable to ILS-III-NM by now*
The **Offset** function can automatically reduce the engraved area.



Common Profile



Shoulder Profile

Gray [3D] :

This mode will transfer all colors in bitmap to 256 gray levels and the strength of laser power depends on the gray level for each pixel. If the **16 Levels** option is enabled, the colors in bitmap will be transferred to 16 gray levels, and you can use **Power Scale** function to adjust the power for each gray level.

B&W mode:

For raster object, this mode converts all colors to gray and use Black laser setting for engraving. This mode still uses eight color settings to cut vector objects.

Mirror:

This option will translate graphics to horizontally flipped negatives.

Resolution

Resolution controls the dot density of laser in raster mode. It does not change the dot size, but rather governs the amount of overlap for neighboring dots. A high resolution gives a higher fill factor, but requires more time to engrave.

Engrave Type

Ends : There are two end modes to choose: Normal and Fine. On the Normal Engrave Type, the engraving range of focusing lens depends on the bounding of figure. The more wide the figure is, the bigger range will focusing lens run. On the Fine Engrave Type, the engraving range of focusing lens fixed on the widest bounding of figure.

Direction : There are two Direction modes to choose: Top to bottom and Bottom to top. The focusing lens engravés from top of the figure to the bottom. The focusing lens engravés from bottom of the figure to the top.

Cut & Engrave Setup

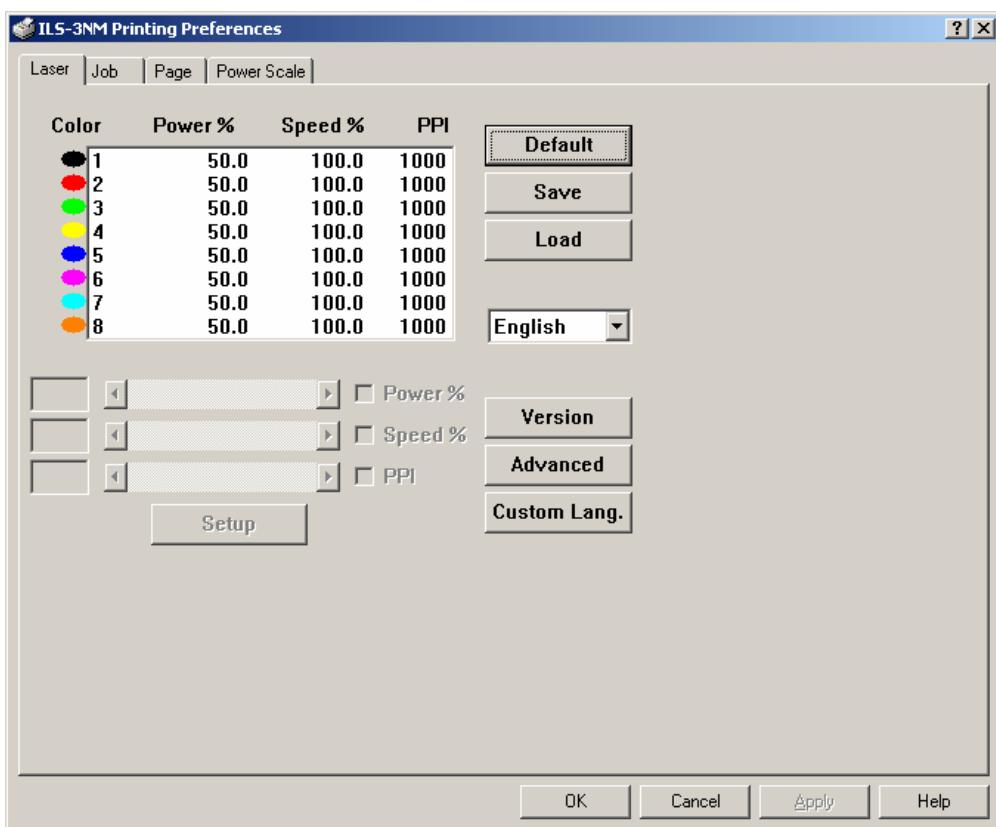
If you enable **Engrave** option, you can decide to enable or disable engrave function for each colors, or you can disable **Engrave** option to disable all eight colors' engrave function.

If you enable **Cut** option, you can decide to enable or disable cut function for each colors and decide the cut order, by drawing or by color. You can also disable **Cut** option to disable all eight color's cut function.

1. By drawing: Vectors are cut in drawing sequence.

2. By color: Vectors are cut according to pre-defined color order. Vectors in same color are cut in the sequence they have been drawn.

4.2.3 Laser



Parameter Setup

The ILS-III-NM provides eight parameter settings. Move your mouse to choose a color by clicking left button once. The parameter of **Power**, **Speed**, and **PPI** of that color will be highlighted. You can either key in the value you want or change it by using the scroll bars. Press **Setup** button to save the new value for each parameter. The value affiliated with the chosen color will change accordingly.

You can click on additional colors to set more than one color, and all the colors you choose will be highlighted. Then do the same as the above procedure.

PPI is only used for cut. **PPI** decides the dot density of laser for vector lines.

Config File Access

Default: Load the default configuration file.

Save: Save current configuration in a configuration file.

Load: Load existent configuration file.

If you have many kind of material and each material has a special set of parameters, you can save the parameter set to a configuration file for each material. When you need to process on a material, just load its configuration file.

User Interface

The default user interface is English. If the local agent supplies local language

interface, you can select it from here.

Version

Display the driver version.

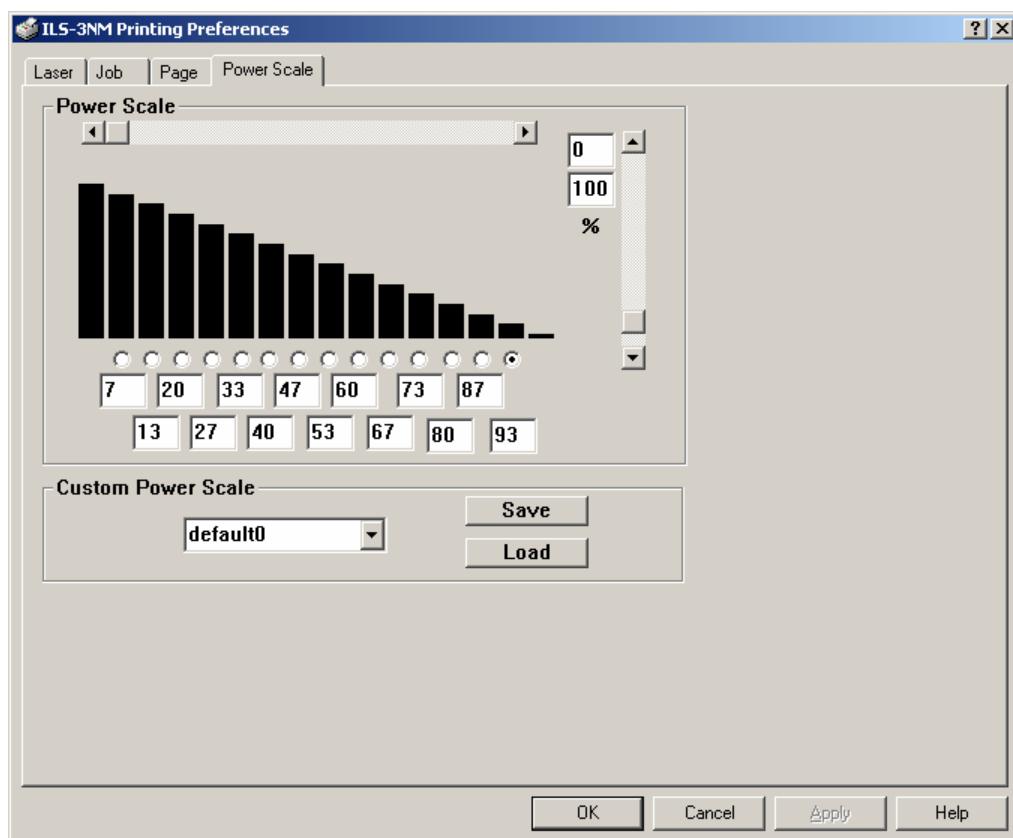
Advanced

This function is used for LTT technician to tune ILS-III-NM, and this is password protected.

Custom Lang.

This function is used for agent to make user interface in local language.

4.2.4 Power Scale



Power Scale

Power Scale function is used to adjust the strength of laser power. If you use **Rubber** mode, the **Power Scale** function will control the curve of tapered profile. If you use **Gray [3D]** mode and enable **16 Levels** option, the **Power Scale** function will control the strength of laser power for each gray level.

Use horizontal scrollbar to load default power scale setting, and use vertical scrollbar or edit box to adjust each power scale. The two editing box beside the vertical scrollbar can limit the power range for default power scale settings.

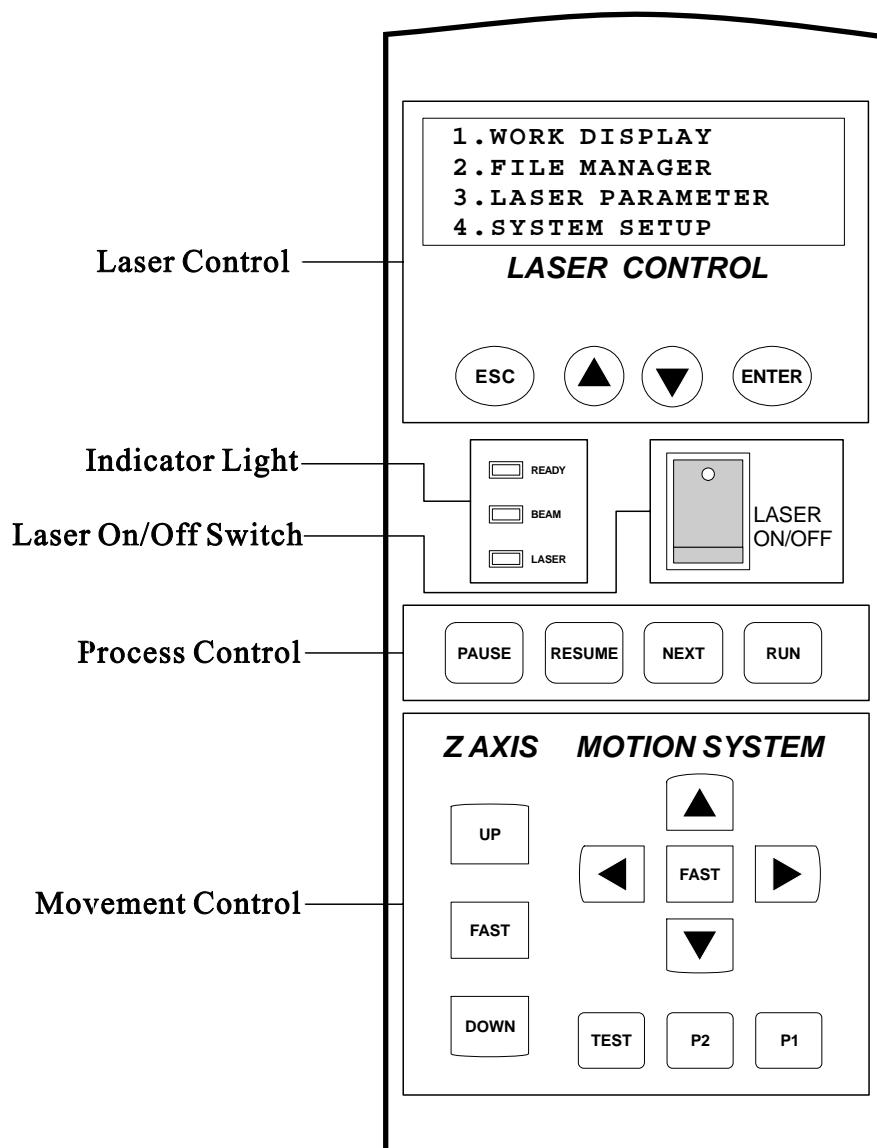
Custom Power Scale

The driver supplies five buffers for **Custom Power Scale**.

CHAPTER 5 LASER SYSTEM OPERATION

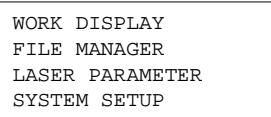
5.1 Control Panel

The Control Panel for the ILS-III-NM is located on the right side of top door. It includes Laser Control Display, Laser On and Off Switch, Indicator Light, Process Control button, and Movement Control Button.



Laser Control Display

The liquid crystal display (LCD) on the top of the Control Panel provides access to the job file information and laser parameters. When the ILS-III-NM is turned on, the LCD should display the following option:



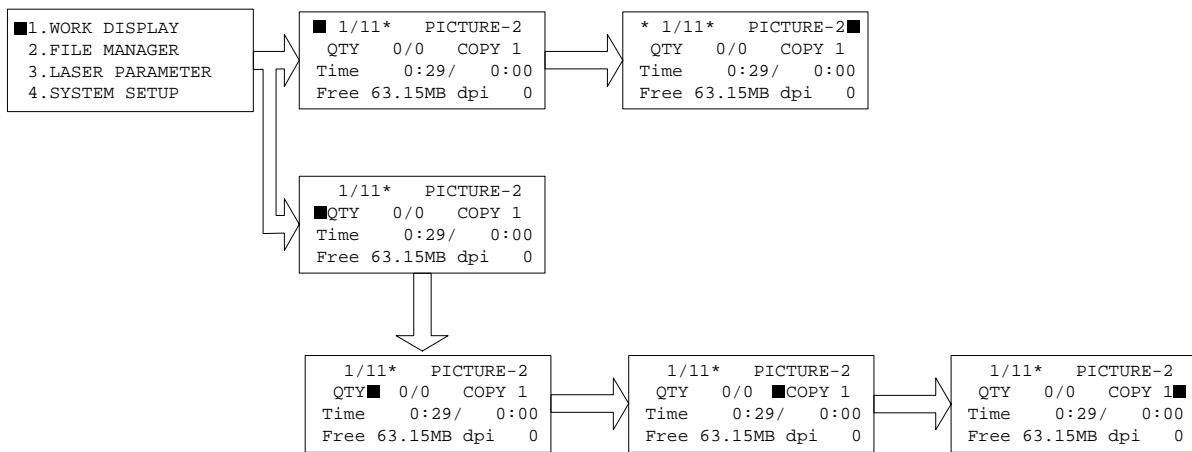
There are four buttons located under the LCD: They are the **ENTER**, **ESC**, **▲**, **▼** buttons.

The functions of those four buttons are as following:

1. The up and down arrow buttons select items vertically.
2. The **ENTER** and **ESC** buttons select items horizontally.
3. When the black box (█) is on the left of an item, you can use the **ENTER** button to select this item or enter the submenu. When the black box is on the right of an item, you can use the **up** and **down** arrow buttons to adjust the values.

5.1.1 Laser Control

5.1.1.1 WORK DISPLAY



The first line indicates that the file selected is file #1 of 11(11 files have been transferred to the ILS-III-NM), with a job title of picture-2. To move from one file to the other, use **NEXT** button. The **NEXT** button only proceeds in forward direction. You can press **ENTER** button to move the black box to the right side of first item, then use **up** and **down** arrow buttons to choose the file in the memory.

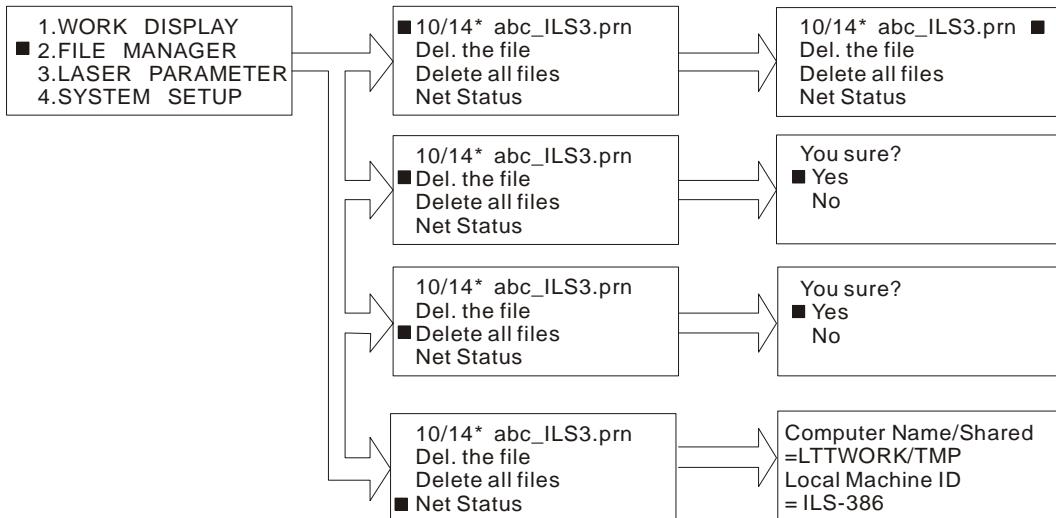
The second line indicates the number of times a job has completed, the total number of jobs requested, and the number of copies of the file per job (usually the copy function is used to make deeper engraving).

For example, you may need to engrave 20 identical plaques. The laser may be currently working on plaque number 5. The LCD displays QTY 05/20 showing that the fifth plaque is in progress. After completing one job, the ILS-III-NM waits for the operator to press **RUN** button to proceed to the next job. After the total quantity has been completed, **RUN** button is no longer active unless the number of quantity to be marked is increased. For materials that need to be processed more than one time, you can set it by the COPY number during a job. For example, you may set COPY number to 5, the ILS-III-NM will execute the marking sequence on the selected file five times during a job, and then stop. After which it will wait for the operator to press **RUN** button to perform the next job.

The third line shows the time in process and the total time required for processing the selected file. The total time will not be displayed until the selected file is executed once.

The fourth line shows the process status setting. If no file is executed, it will display available memory. If a file is being executed, it will be displaying the current power and speed.

5.1.1.2 FILE MANAGER



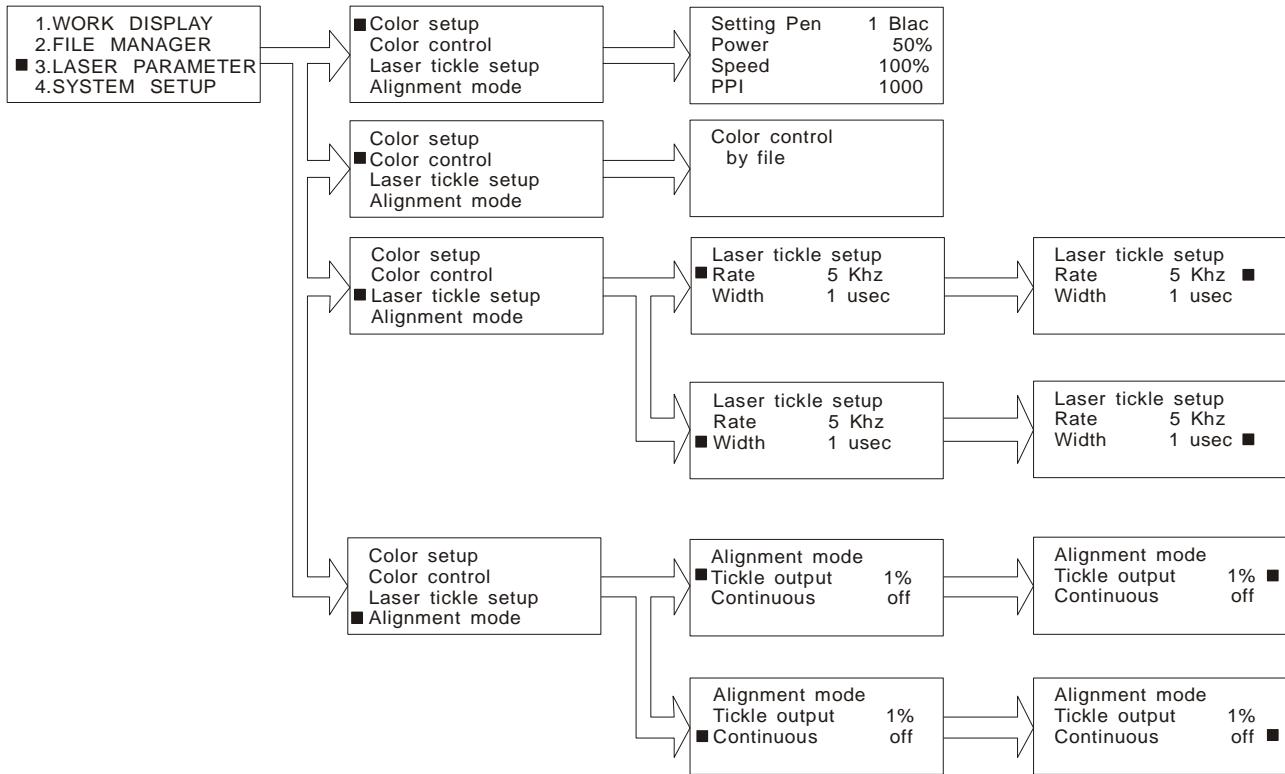
The first item shows the number and name of the selected file. When black box is at the left of first item, you can press **ENTER** button to move the black box to the right of first item, then use up and down arrows to change to different file you have transferred to the ILS-III-NM.

Del. the file : Delete the selected file.

Delete all files : Delete all files that transferred to ILS-III-NM.

Net Status : The displaying computer name and shared directory should be identical to that of the computer. This information is used for net setting. If you want to send files by net, please contact LTT.

5.1.1.3 LASER PARAMETERS



Color setup: The parameters of each color (power, speed, and PPI) can be adjusted under this submenu.

Color control: By file means the parameters are governed by ILS-III-NM driver, while by panel are by previous settings in **Color setup** submenu.

Laser tickle setup: You can set rate and width of tickle in this submenu.

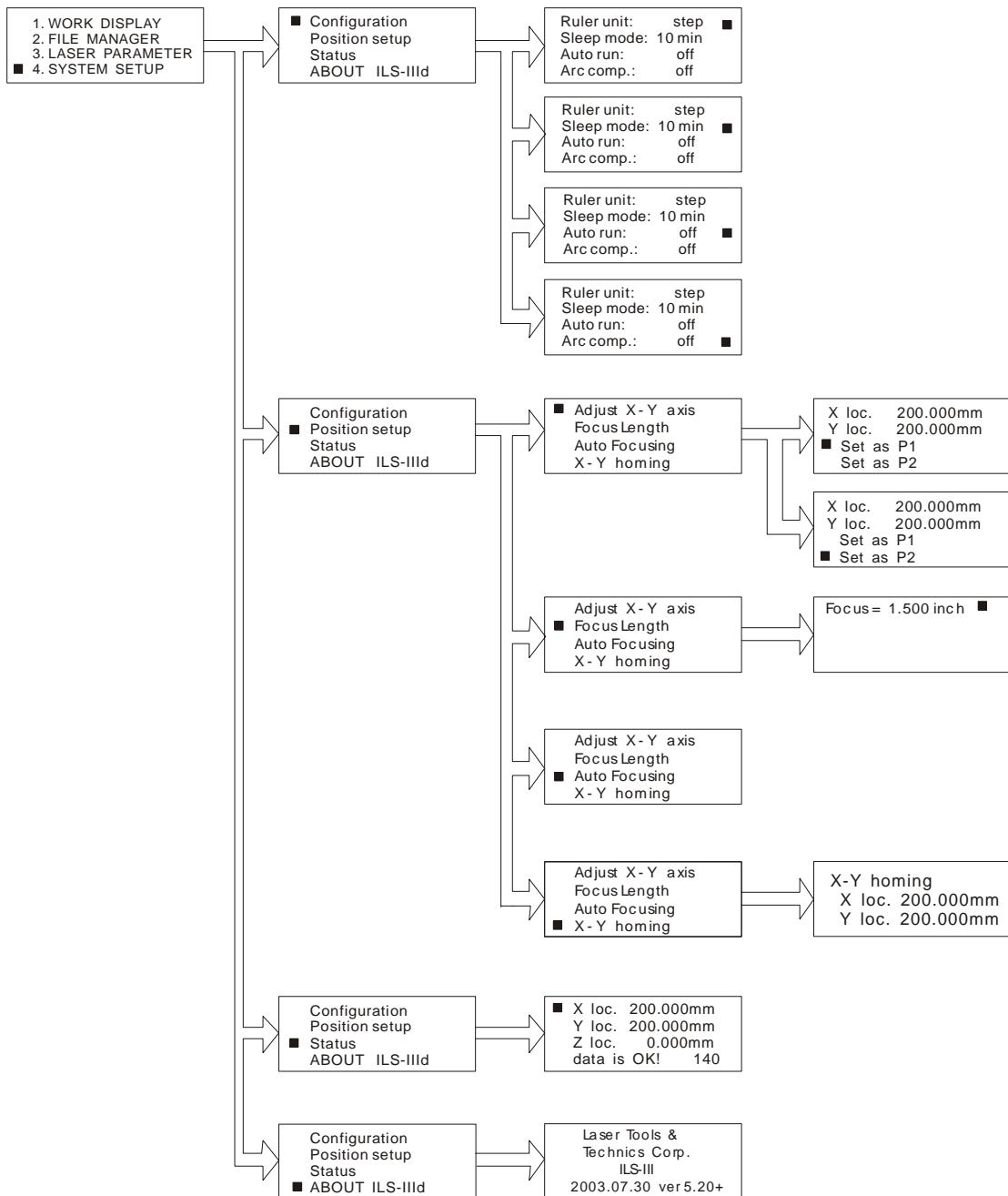
Tickle comprises of short pulses, which are sent to the laser to pre-ionize the gas so that the laser energy stays near the lasing threshold. In other words, without the tickle pulses, or with too little tickle, the laser becomes (comparatively) sluggish and unpredictable. Too much tickle causes laser emission. Just the right tickle allows the laser to respond quickly and predictably. Tickle is set by the factory and should not be adjusted by the end user.

Alignment mode: **YOU MUST BE VERY CAREFUL WHEN YOU ENTERED THIS SUBMENU.**

This function is used for laser alignment. You can press TEST button, which is located at the lower part of Control Panel, to force laser emission.

If **Continuous** is set **on**, the laser will emit after you press TEST button, and you must press TEST button again to stop laser emitting. If **Continuous** is set **off**, the laser will emit only when the TEST button is pressed and held. Refer to section 6.2 for details of alignment.

5.1.1.4 SYSTEM SETUP



Configuration submenu has four items:

- Ruler unit:** There are three kinds of unit to choose.
- Sleep mode:** Automatically turn off the laser head after the machine was idled for specified time.
- Auto run:** This item has no function yet.
- Arc comp.:** Compensate laser output power during cutting an arc.

Position Setup submenu has two items:

- Adjust X-Y axis:** You can see the position of focusing lens, and set specified position to **P1** and **P2**. This is useful when you always need to move focusing lens to a particular position.

- Focus Length:** Change focal length - please change it via **▲▼** buttons. (To know more detail, please refer to Appendix A AUTO FOCUS SUPPLEMENT)

NOTES: Although there are three optional figures to be selected, we strongly recommend that do NOT change the default of 1.5 inch, to avoid any unexpected results. That is, the default should be exactly same spec. as the focus lens of this machine.

- Auto Focusing:** Focusing the laser automatically. (To know more detail, please refer to Appendix A AUTO FOCUS SUPPLEMENT)

- X-Y homing:** This function will move the motion system to the origin of coordinate system.

Status: This function will show the position of X, Y, and Z-axis.

ABOUT ILS-III-NMd: Shows the ILS-III-NM firmware version.

5.1.2 Laser On and Off Switch

If, for whatever reason, you wish to cut off laser power immediately, simply turn off this switch. This switch will not terminate the movement of the focusing lens assembly; it simply shuts off the laser beam. The ILS-III-NM does not record the location where you last turned the power off; therefore, you could not return to the same location and continue the job. Note that this is only a safety switch.

5.1.3 Indicator Light

There are three indicator lights in the middle of Control Panel showing the status of laser system. There is a green indicator light for **READY**, a red indicator light for **BEAM**, and an orange indicator light for **LASER**.

READY: the green indicator light will turn on after the power of ILS-III-NM is turned on for a few seconds and the system is ready for operation. If the green indicator light does not turn on after the power is turned on, please contact LTT for technical assistance.

BEAM: the red indicator light shows that the laser beam is emitting and it will blink during engraving to indicate that the signal is transferred from system controller to the laser generator.

LASER: The orange indicator light will remain on after **LASER ON/ OFF** switch is turned on as well as the top and the front doors are closed. When the orange indicator light is on, it means the laser is stimulated, but laser may be or may be not emitting. If the BEAM indicator light is on too, then it means laser is emitting.

If the top door or the front door is opened during engraving, the laser power will be turned off immediately and LASER indicator light is turned off. This will not terminate the movement of the focusing lens assembly. If the LASER indicator light remains on after the top door or the front door is opened, turn off the power of laser system and contact LTT for technical assistance. Do not continue operating, the laser may damage your eyes or skin.

5.1.4 Process Control Button

Process control buttons include **PAUSE**, **RESUME**, **NEXT**, and **RUN**. You have to use those buttons when you need to run a job file, interrupt a job file or resume the same job file starting from the last location later.

PAUSE: **PAUSE** does not immediately terminate the laser beam and the traveling of the focusing lens assembly. The system will find suitable point to stop the job. For example, when cutting a series of outlines, the laser will probably finish some contours then stop .If you need to stop the laser operation immediately, use the **LASER ON/OFF** switch.

RESUME: **RESUME** will continue a paused job file.

NEXT: **NEXT** will scroll the selected file into next file in the buffer. Pressing **NEXT** while a job is paused will cancel that job.

RUN: **RUN** will execute the selected job file.

5.1.5 Movement Control Button

Movement control buttons are used to control the movement of focusing lens assembly in X and Y axes as well as height of working table in Z direction manually. These buttons are usually used for alignment or focusing purposes.

Z AXIS

There are three buttons for the Z-axis adjustment: **UP**, **DOWN**, and **FAST**. Press **UP** or **DOWN** button to move the working table upward or downward. Press **UP** or **DOWN** button along with **FAST** button will move fast.

MOTION SYSTEM

These four arrow buttons provide fine adjustment of the location of focusing lens assembly in X and Y directions. Press arrow button along with the centered **FAST** button accelerates the moving.

TEST: The **TEST** button is used for alignment purposes. This button has no effect unless **Alignment mode** submenu is selected.

If **Continuous** is set to **on**, the laser will emit after you press **TEST** button, and you must press **TEST** button again to stop laser emitting. If **Continuous** is set to **off**, the laser will emit only when the **TEST** button is pressed and held.

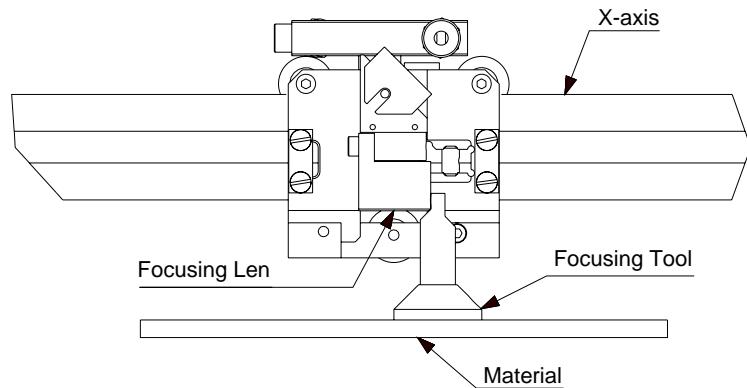
P1: Move the focusing lens assembly to the P1 position.

P2: Move the focusing lens assembly to the P2 position.

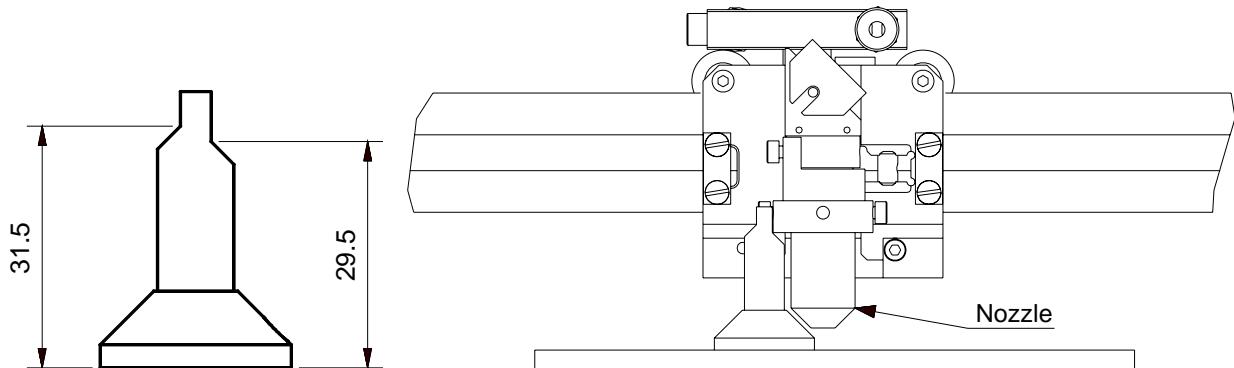
5.2 Focusing the Laser

Note: For those models with which incorporated "Auto-Focus" function, please refer to Appendix A.

- Step 1 Move the focusing lens assembly over the material.
- Step 2 Position the focusing tool between the focusing lens assembly and the material.
- Step 3 Adjust the height of working table until the focusing tool begins to tilt away from the focusing lens assembly.
- Step 4 Focusing procedure completes.



NOTE: Do not adjust the working table height during file execution! This will change the focal distance and makes unpredictable result.



5.3 Engraving Procedure

The following outline is an operation procedure. Please follow this procedure to understand the steps necessary for laser engraving. Please operate the equipment in the stated order.

Starting the system

- Step 1 Ensure that the exhaust system has connected properly.
- Step 2 Verify that the laser on/off switch was turned off.

Processing a task

- Step 1 Activate the main power switch.
- Step 2 Turn on the computer and then the laser on/off switch.
- Step 3 Position the material onto the working table.
- Step 4 Put the focusing tool on the material and move focusing lens assembly above it. Adjust the height of working table to focal distance as described in section 5.2.
- Step 5 Use graphics software to draw the desired graphic. The location of graphic in the page of software must be the same as material on the working table.
- Step 6 Set Power, Speed, PPI and other parameters in ILS-III-NM printer driver.
- Step 7 Transfer the graphic file from computer to the laser system by ILS-III-NM print driver.
- Step 8 Turn on the exhaust system.
- Step 9 After the file is transferred to the ILS-III-NM, press RUN button to start processing.
- Step 10 **NEVER OPERATE THE LASER SYSTEM WITHOUT ANY CLOSING SUPERVISION ON THE MACHINE.**

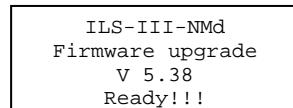
Turning off the system

- Step 1 Turn off the laser on/off switch.
- Step 2 Turn off the exhaust system.
- Step 3 Turn off the main power.
- Step 4 Turn off the computer.

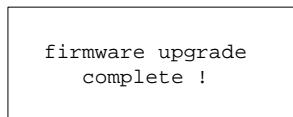
5.4 System Upgrade

ILS-III-NM has an upgrade function. This makes ILS-III-NM easier for future improvement of system efficiency and functions. The following is the upgrade procedure.

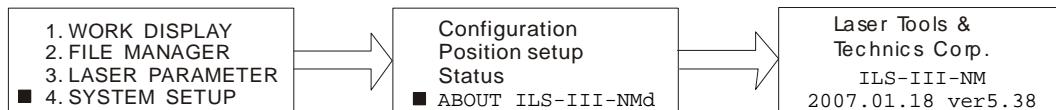
- Step 1 Make sure that the upgrade disk is the latest version provided by LTT.
- Step 2 Verify that ILS-III-NM and computer is connected well and both are off.
- Step 3 Turn on the computer. Press and hold the **ENTER** button on the Control Panel right after turning on ILS-III-NM until the following screen appears.



- Step 4 Insert upgrade disk to floppy drive in the PC.
- Step 5 Go to DOS box and type "A: <Enter>" then "copy i3f-xxx.ice lpt1 <Enter>" to start the upgrade. I3f-xxx.ice is the filename of the firmware. For example, it can be i3f-505.ice. "<Enter>" means hit the enter key of the keyboard.
- Step 6 You will hear two short beeps along with the following display, showing that the upgrade has completed successfully.



- Step 7 Press ESC button on the Control Panel and you will hear a beep after which ILS-III-NM returns to main menu.
- Step 8 Check the firmware version in **ABOUT ILS-III-NMd** submenu.



If the power of ILS-III-NM or computer is turned off, or the cable is disconnected while upgrading, the ILS-III-NM may not be upgraded in the future. If this situation occurs, please contact LTT.

CHAPTER 6 MAINTENANCE and ADJUSTMENT

6.1 Maintenance

6.1.1 General Cleaning of the Laser System

A visual inspection of the machine should be done at least once a day. If dirt or debris is present, a general cleaning should be performed. The frequency of cleaning will depend entirely on the type of material being processed. If dirt is built up in any parts of the motion system, this may cause uneven engraving or loss of position, as well as damages to optics and premature failure of the motion system components.

NOTE: **The rails of the system should be wiped with a dry lint free cloth at least once a day regardless of whether a general cleaning is required. This will guarantee longer bearing life.**

CAUTION: Never lubricate the motion system!

WARNING: Always turn the laser system off and unplug it before performing any cleaning procedures.

6.1.2 General Cleaning Procedure:

1. Ensure that the system is turned off and the cord unplugged.
2. Thoroughly remove all loose dirt and debris from inside of the machine.
3. Clean the working table surface with glass cleaner.
4. Clean all of the rails of the motion system, using cotton swab and alcohol.
5. After the rails are cleaned, use a clean swab and alcohol to clean all of the bearings by holding the swab against each bearing and moving the motion system by hand to roll the bearings against the swab.
6. Clean the exhaust. If the air filter inside the exhaust is dirty, clean it by submerging it into a mild soap solution. Then rinse it clean and allow it to air dry. If the air filter becomes too dirty, it may restrict air flowing and which may cause the laser system less effective.
7. Clean the top window with tissue. Do not use paper towels because they will scratch acrylic.

6.1.3 How to Clean the Optics

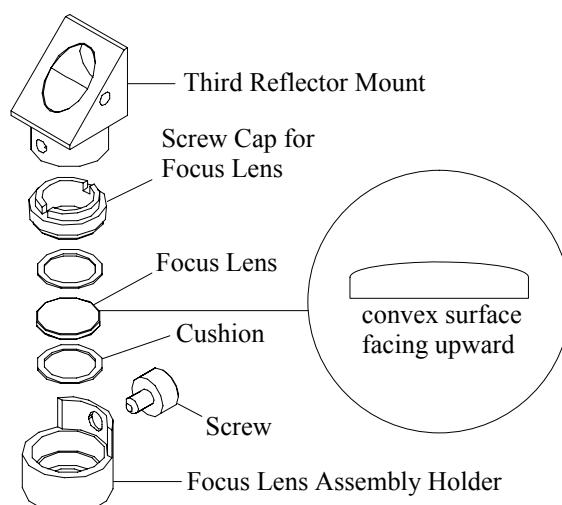
The optical elements in the system are provided with a durable, multi-layer coating. They can withstand repeated cleanings if they are cleaned properly. A visual inspection of the mirrors and lenses should be performed at least once a day. If a haze or debris is present on the optical surfaces, they should be cleaned. As a general rule, if the machine itself needs cleaning, the optical elements need too.

6.1.4 Cleaning the Lens

1. Remove the screw from the side of the lens holder located on the movable optics carriage. Hold the lens holder while removing the screw so that the holder and lens do not drop.
2. Inspect the lens while still in the holder. If the lens does not look too dirty or most of the dirt seems to be on the bottom surface of the lens, leave the lens in the holder and clean only the bottom surface following the cleaning instructions below. If the lens is extremely dirty, it will need to be disassembled.
3. To disassemble the lens holder assembly, loosen the screw insert while keeping the housing flat so the lens does not fall out.
4. Remove the lens from the lens holder by holding it in one hand and a clean sheet of lens tissue flat in the other hand. Carefully turn the lens holder upside down onto a piece of the lens tissue.
5. Hold the lens by its edges using lens tissue, and with a stream of lens cleaning solution that came with the system, flush both surfaces of the lens.
6. Apply some of the lens cleaning solution on to one surface of the lens. Let it sit for approximately one minute and then gently wipe the surface using swabs soaked with lens cleaning solution.
7. Dry that side of the lens using a new swab and repeat the process to clean the other side of the lens.

CAUTION: Never reuse the swab. Dust build-up on the tissue may scratch the surface of the lens.

8. Inspect the lens. If it is still dirty, repeat the cleaning procedure until it is clean.
 9. Gently insert the lens into the lens holder ensuring that the curved side of lens is facing upward. Then tighten the screw insert into the lens holder.
- CAUTION: Over-tightening the threaded insert could break the lens.**
10. Hold the lens holder carefully in one hand and move it below the lens mount, the other hand tighten the screw snugly.

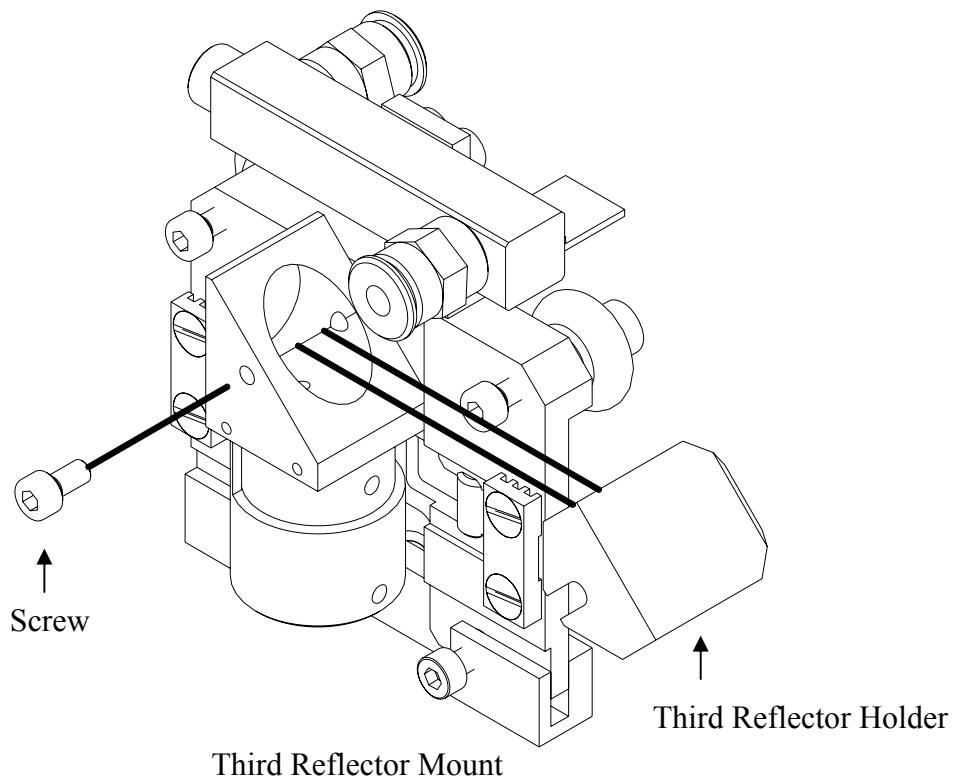


6.1.5 Cleaning the Mirrors

There are two mirrors inside the processing area of the system that need cleaning. Follow the procedure below to clean both mirrors.

1. While holding the mirror bracket, remove the screw and lift mirror and holder away from the mirror mount. Be careful not to slide the mirror across the mount since they can be scratched easily.
2. Apply lens cleaning solution to the mirror and let it sit for approximately one minute.
3. Using a swab gently wipe off the solution on the mirror once. Use a new swab and repeat until the mirror is clean. Never reuse a swab as dust build-up on it may scratch the surface of mirror.
4. Inspect the mirror and repeat the procedure if necessary until the mirror is clean.
5. Replace the mirror on the mirror mount by setting the mirror bracket straight down on to the mount. Make sure that the mirror is sitting flat against the holder otherwise a beam misalignment can occur. Replace the M4 screw and tighten it securely.

CAUTION: Sliding the mirror on the holder can scratch it.



6.2 Adjustment

Mirror Alignment Procedure

CAUTION!

This procedure requires overrule of the safety interlock system. The laser emits dangerous invisible radiation. Be extremely careful to avoid eye or skin exposure to direct or scattered radiation.

Please follow all instructions exactly. Observe all relevant safety regulations at all times.

YOU MUST WEAR APPROPRIATE LASER SAFETY GOGGLES FOR THIS PROCEDURE.

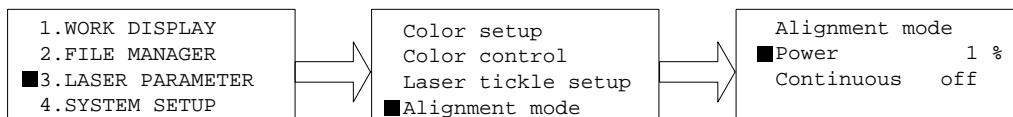
Tools required:

1. Laser safety goggles
2. Thermal print fax paper (the greasy kind that turns gray if you scratch it)
3. Double sided tape (low tack, i.e. can be easily removed)
4. Allen wrenches

Alignment Procedure

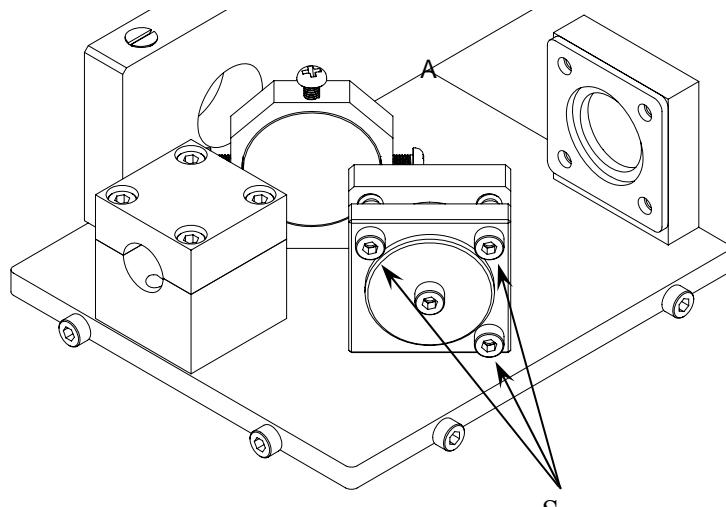
STEP 1

Enter the ALIGNMENT MODE submenu as follow:



STEP 2

Remove the cover of first reflector, and you can see three screws. You can tighten or loosen them individually to change the path of laser beam.



STEP 3

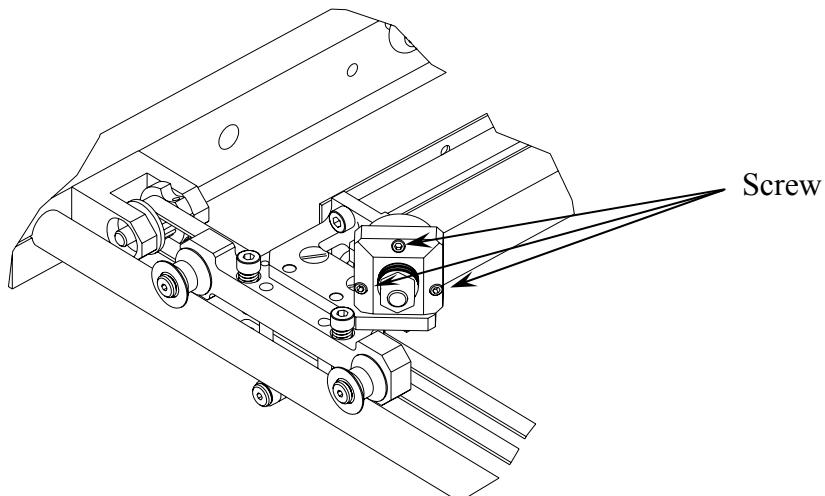
Cut off about 2.5 cm of thermal paper and attach it to the double side tape with the greasy side out. Attach the tape to the second reflector on the side laser beam enters. If you run your finger or fingernail lightly along the opening under the fax paper, a gray outline of the opening appears, which is useful in centering the beam.

STEP 4

Press **TEST** button to emit laser. The laser beam should hit the center of the second reflector. If not so, you can tighten or loosen those screws on first reflector mount to change the angle of reflector and then correct the path of laser beam.

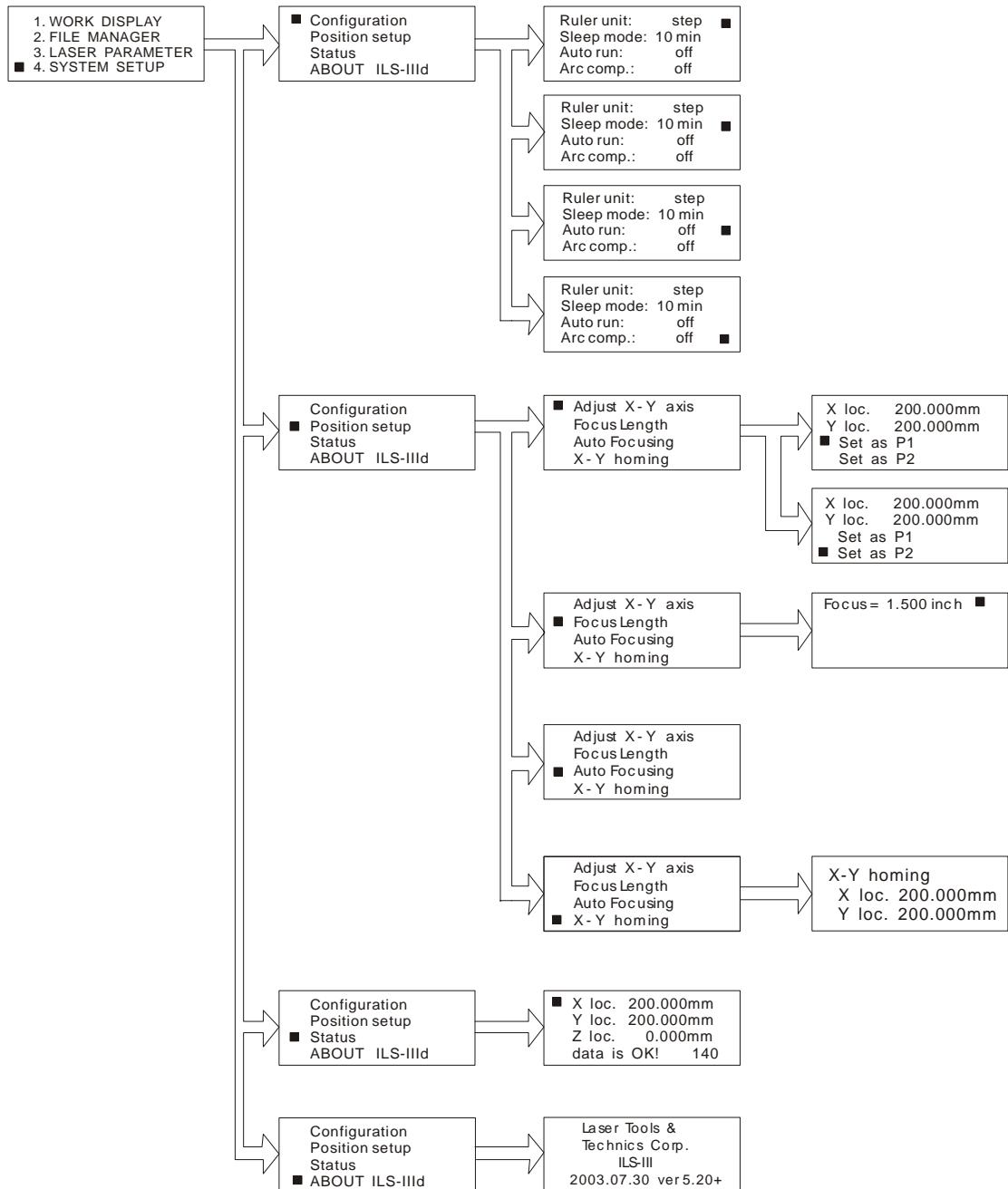
STEP 5

After the laser beam is exactly in the center of the second reflector, proceed to the alignment of the second reflector. The laser beam should hit the center of the third reflector. If you want to adjust the laser beam in horizontal direction, you can tighten or loosen the horizontal adjustment screw. If you want to adjust the laser beam in vertical direction, you can loosen the vertical adjustment screw, then adjust the angle of second reflector mount by rotate it, and then tighten the vertical adjustment screw.



This alignment procedure must be performed by a fully trained service technician. If you have any question, please get in touch with the local commercial agency or directly to the LTT to get proper assistance.

Laser Control Display Revision



Position Setup submenu is quite different than before. There are four items now. Item 2 and 3 are exclusive to this version. Functions are described as follows.

Focus Length: Change focal length – please change it via \blacktriangle \blacktriangledown buttons.

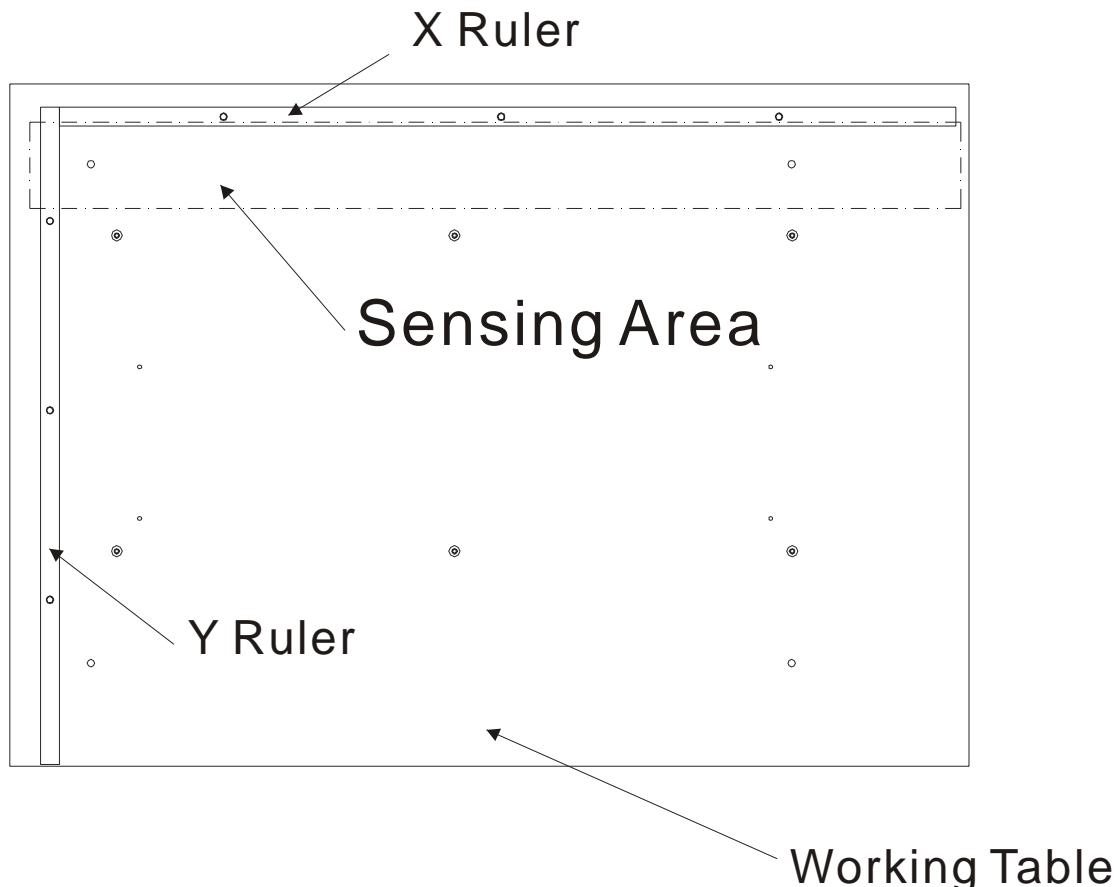
NOTES: Although there are three optional figures to be selected, we strongly recommend that do **NOT** change the default of **1.5 inch**, to avoid any unexpected results. That is, the default should be exactly same spec. as the focus lens of this machine.

Auto Focusing: Focusing the laser automatically.

Focusing the Laser

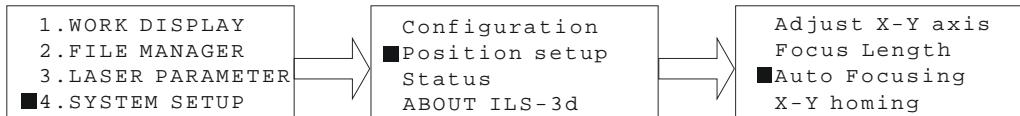
Step 1 Put work-piece which is going to be engraved onto working table of ILS-III-NM.

Step 2 Place the work-piece approaching the X-Ruler – so that the work-piece could shield/cut the sensing path of the sensor while the working platform is moving up (refer to the illustration that follows, dashed rectangle represents sensing area).



NOTE: Work-piece **MUST** be thicker than 3 mm (1/8 inch), otherwise, incorrect height will be obtained.

Step 3 Enter the **POSITION SETUP** submenu as follows:



Step 4 Move the cursor to item 3 “Auto Focusing” then press **Enter**.

Step 5 Focusing procedure completes.